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GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

SECTION 1 – GENERAL
PART 1 – GENERAL PROVISIONS

1.1.1 General Matters.

1.1.1.1 Project Team. To accomplish Owner's objectives, Owner employs a team concept in connection with the construction of the Project. The basic roles and general responsibilities of team members are set forth in general terms below but are more fully set forth in the Design Professional Contract with respect to the Design Professional.

(a) Relationship of Parties. The Owner and the Contractor agree to proceed with the Project on the basis of trust, good faith, and fair dealing and to cooperate fully with each other. The Owner and the Contractor shall do all things reasonably necessary to perform this Contract in an economical and timely manner, including without limitation, consideration of design modifications to enhance constructability and alternative materials or equipment, if considered necessary or convenient by the Owner. The Contractor agrees to procure or furnish, as permitted by the laws of Georgia, all Pre-Commencement phase services and construction phase services as set forth herein. The Owner shall endeavor to promote harmony and cooperation among the Owner, Program Manager, Design Professional, the Using Agency, Contractor and other persons or entities employed by the Owner for the Project.

(b) Design Professional. The Design Professional is retained (i) for the design of the Project; (ii) for the preparation of Construction Documents that are necessary to implement the construction of the Project; and (iii) for Construction Contract Administration of the Work under Contract Documents. The Contractor acknowledges and agrees that the Contract Documents are addressed to skilled tradesmen in the construction profession who shall be required to use their special skills and experience, through submittals and shop drawings, to translate the Design Professional's design intent as expressed in the Contract Documents into a completed structure. The Contract Documents shall specify when shop drawings or submittals require the seal of a specialty consultant.

(c) Owner's Representative. Owner shall from time to time in writing designate one person as Owner's Representative under this Contract who shall serve as Owner's Representative unless or until Owner gives notice in writing of the appointment of his successor. All requests for consents and approvals required of Owner in connection with the Project shall be submitted to Owner's Representative. Design Professional and Contractor may rely upon written consents and approvals signed by the Owner's Representative as the consent and approval of Owner.

(d) Using Agency, Using Agency's Representative. The Project is intended for the benefit of the Using Agency. A copy of all matters submitted to Owner shall also be submitted to Using Agency for Using Agency's information. Neither the Using Agency nor any representative of Using Agency shall have any authority to act for or in the name of the Owner. Participation in the Project by Using Agency or its representative(s) shall be solely advisory to the Owner. The Contractor must not act or rely solely upon any directive, interpretation, decision, act, or omission of Using Agency or the Using Agency's Representative.

1.1.1.2 Authority of Contractor. Contractor is, and at all times during the term of this Contract shall be, an independent contractor in the performance of its duties and obligations under this Contract. Contractor shall have no authority to bind or otherwise obligate Owner, orally, in writing or by any acts, unless specifically authorized by Owner in writing. Nothing contained in this Contract shall constitute or be deemed or construed to create a partnership or joint venture, or any agency relationship, between Owner and Contractor.

1.1.1.3 Forms and Specimens. The forms and specimens for this Project are found in Section 7 of the current full form Design-Bid-Build construction contract and are incorporated by reference herein and shall be executed in substantial conformance as required or convenient under the Contract Documents.

1.1.2 Third Party Beneficiary. Contractor acknowledges, stipulates, and agrees that the Owner is a public department, agency, or commission of the executive branch of government of the State of Georgia performing an essential public and governmental function by means of the Contract. Contractor acknowledges, stipulates, and agrees that the Using Agency is an express third party beneficiary of this Contract. There are no individual or personal third party beneficiaries of this Contract.

1.1.3 Notice.

1.1.3.1 General Requirement. Any notice, election, demand, request, consent, approval, or other communication required or permitted to be given under this Contract shall be in writing signed by an officer or duly authorized representative of the party making same and shall be delivered personally or shall be sent by certified or statutory mail, postage prepaid, return receipt requested, shall be effective as of the date on which it is received or would have been

received but for the refusal of the addressee to accept delivery, and shall be addressed as shown in the Contract. The persons and addresses to which notices should be given may be changed by notice given hereunder.

1.1.3.2 Copies of Notices to Owner. Wherever the Contract Documents provide that a copy of any notice, request, or demand filed with the Design Professional by the Contractor shall be furnished to the Owner, such notice, request, or demand shall not become effective until the Owner has received his copy. No notice in writing or given orally to the Design Professional or to the Contract Compliance Specialist is notice to the Owner unless copy of the aforesaid notice in writing shall have been properly served upon the Owner at the address shown in the Contract.

1.1.4 Liquidated Damages.

1.1.4.1 Time of the Essence. Time being of the essence of this Contract, and a material consideration thereof, it is mutually agreed by the parties hereto in case of the Contractor's failure to complete the construction within the time specified, the Owner will be damaged thereby. The Contractor shall commence performance of the Work on the Site under this Contract as of the Proceed Order Date. The Contractor shall complete construction, except for Minor Items and Permitted Incomplete Work (*see* Part 6 below), not later than the Material Completion and Occupancy Date, as adjusted by Change Order.

1.1.4.2 Liquidated Damages. Because it is difficult to definitely ascertain and prove the amount of said damages, inclusive of, but not limited to, expenses for inspection, superintendence, loss of use, and necessary traveling expenses, the Owner, Contractor, and Using Agency hereby agree that the amount of such damages shall be the daily rate specified in the Contract, beginning upon the contractually required Material Completion and Occupancy Date and ending on the date that the Certificate of Material Completion is issued. The parties agree that the specified Liquidated Damages are not established as a penalty but are calculated and agreed upon in advance as a fair and equitable amount reasonably estimated in advance to cover losses to be incurred by the Owner and Using Agency for such delay or interruption in view of the uncertainty and impossibility of ascertaining actual damages that would be incurred.

(a) Contractor Agrees to Pay. The Contractor agrees to pay the amount, computed by multiplying the Liquidated Damages set forth in the Contract by the number of days between the contractually required Material Completion and Occupancy Date and the date that the Certificate of Material Completion is issued.

(b) Deducted as They Accrue. Liquidated Damages shall be deducted from periodic payments as they accrue and such deduction shall be in addition to the retainage provided for in the Contract. The remaining balance of any Liquidated Damages shall be deducted from the Payment for Material Completion to the Contractor or its Surety. If the unpaid balance of the Contract Sum is less than the total amount to be deducted for Liquidated Damages as herein above provided, the Contractor shall promptly pay to the Owner, upon the Owner's demand, the amount by which such sum exceeds the unpaid balance of the Contract Sum.

1.1.4.3 Limitation on Owner's Damages. Except as otherwise set forth in the Contract Documents, damages of the Owner and Using Agency for delay shall be limited to the Liquidated Damages as defined herein. Nothing in this Article 1.1.4 shall be construed to limit Owner's right to pursue damages or remedies for claims against the Contractor for reasons other than delay.

1.1.5 Documents.

1.1.5.1 Precedence of Documents and Changes. In the event of conflict, the Contract takes precedence over the Supplementary Conditions, and the Supplementary Conditions take precedence over the General Conditions. No change to the Contract Documents is effective unless issued by the Owner bearing its imprimatur as follows:

"By order of the Owner."

The Design Professional has no authority to amend the Contract, the General Conditions, or the Supplementary General Conditions, orally or in writing, either expressly or by implication.

1.1.5.2 Marked-Up ("As-Built") Documents. Prior to Final Completion, the Contractor shall provide one complete set of Marked-Up Documents to the Design Professional. The Marked-Up Documents shall consist of the Contract Documents annotated and changed to reflect the as-built condition of the Project, including all Change Orders, field instructions, answers to RFI's, clarifications, sketches, delegated contractor design drawings and locations of utilities and other hidden elements.

1.1.6. Defined Terms. Wherever used in the Contract Documents, the terms defined in this Contract will have the meanings indicated that are applicable to both the singular and plural, and to the masculine and feminine thereof. Words used in the Contract Documents that have usual and common meanings shall be given their usual and common meanings; words having technical or trade meanings shall be given their customary meaning in the subject business, trade, or profession. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents may include references to identified articles and paragraphs, and the titles of other documents or forms. A full set of definitions is found in Article 1.1.8 of the current full form Design-Bid-Build construction contract.

PART 2 – CONTRACTOR'S GENERAL RESPONSIBILITIES AND DUTIES

1.2.1 Contractor's General Responsibilities.

1.2.1.1 Representations of Contractor.

1.2.1.1.1 Independent Contractor. The Contractor represents that it is an independent contractor, competent, knowledgeable, and familiar with the type of work contemplated by this Contract. The Contractor shall furnish construction administration and management services and use the Contractor's best efforts to perform the Project in an expeditious and economical manner consistent with the interests of the Owner.

1.2.1.1.2 Familiarity with Project. Contractor represents that it has: (a) visited and examined the Site(s), (b) taken into account local conditions and observed conditions that affect the Project, the Work, or the cost thereof, (c) investigated the labor situation related to the Project, (d) examined the superintendence of the Project, the Work, the time of completion, and other relevant matters, and (e) has taken these into consideration in submitting his bid.

1.2.1.2 Responsibility to Coordinate. Contractor acknowledges its responsibility to coordinate the Work with that of Separate Contractors to be selected for the installation of other work within the Project.

1.2.1.3 Contractor's Warranty as to Performance. The Contractor warrants that he is familiar with the codes applicable to the Work and that he has the skill, knowledge, competence, organization, and plant to execute the Work promptly and efficiently in compliance with the requirements of the Contract Documents. The Contractor has the obligation to keep a competent superintendent on the Work during its progress, to employ only skilled workers, and to enforce strict discipline and good order among his employees. The Contractor is responsible for seeing that the Work is installed in accordance with the Contract Documents. Failure or omission on the part of the Owner, representatives of the Owner, agents of the Owner, the Contract Compliance Specialist, engineers employed by the Design Professional, representatives of the Design Professional, or the Design Professional either to discover or to bring to the attention of the Contractor any deviation from, omission from, or noncompliance with the Contract Documents shall not be used by the Contractor or its surety as a defense for failure on his part to install the Work in accordance with the Contract Documents or for any other neglect to fulfill requirements of the Contract; neither shall the presence of the Owner, Design Professional or their representatives on the Project Site or that they may have examined the Work or any part of the Work be used as a defense by the Contractor against a claim for failure to install the Work in accordance with the Contact Documents or to fulfill requirements of the Contract.

1.2.2 Contractor's General Duties.

1.2.2.1 Construction Staging and Construction Services. The Contractor shall provide and pay for all labor, materials, equipment, transportation, construction, resources, work, and services necessary or incidental to completing the Work for the Project in a proper and timely manner in accordance with the Contract Documents and applicable laws.

1.2.2.2 Supervision and Direction. Contractor shall supervise and direct the Work using diligent skill and attention smf shall be responsible for and shall coordinate all construction means, methods, techniques, sequences, and procedures.

1.2.2.3 Enforce Discipline. Contractor shall at all times enforce strict discipline and good order among its employees, Subcontractors, and others performing the Work, and shall permit the employment of unfit or unskilled.

1.2.2.4 Security Clearances. Where work is required within a specially secured controlled access environment, work shall be performed by personnel who have passed a security screening.

1.2.2.5 Maintain Records. Contractor shall maintain records of the cost for the Work pursuant to and in compliance with proper accounting requirements and include complete backup documentation for all pay applications.

1.2.2.6 Answer Questions. Contractor, with reasonable promptness and in accordance with time limits set by Owner, shall answer Owner's questions and provide Owner with requested Project information.

1.2.2.7 Acts and Omissions. The Contractor is responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons.

1.2.2.8 Contractor. Contractor shall, accomplish all required submittals, and such Change Orders as may be issued.

1.2.2.9 Meetings. Contractor shall schedule and conduct meetings with the Owner, Design Professional, and appropriate Subcontractors, at least biweekly, to discuss the status and progress of the Work.

1.2.3 Audit, Open Records Act. The Owner may select an auditor to examine and inspect the Project and the Contractor's books, records, and any and all accounts and similar data related to the Project. The Owner shall bear the cost of such audit. The auditor may sign a confidentiality agreement before conducting any such audit. Notwithstanding such agreement, Contractor understands and agrees that all project records are subject to the Georgia Open Records Act.

1.2.4 Employment of Georgia Citizens and Preference for Georgia Supplies, Materials, Equipment and Products and Georgia Forest Products. Given that the Work provided for in this Contract is to be performed in Georgia, it is the wish of the Owner that supplies, materials, equipment, products and agricultural or forest products manufactured or produced in Georgia shall be used in the Work and that Georgia citizens shall be employed in the Work at wages consistent with those being paid in the general area in which the Work is to be performed. This desire on the part of the Owner is not intended to restrict or limit competitive bidding nor to increase the cost of the Work; nor shall the fulfillment of this desire be asserted by the Design-Builder as an excuse for any noncompliance or omission to fulfill any obligation under the Contract. The provisions of O.C.G.A. §§50-5-60 through 63 are further incorporated into the General Conditions of the Contract as generally expressed below:

(a) No contract for the construction of, addition to, or repair of any facility, the cost of which is borne by the State, or any department, agency, commission, authority, or local government thereof shall be let, unless said contract contains a stipulation therein providing that the Design-Builder, Construction Manager or Subcontractor shall use exclusively Georgia supplies, materials, equipment, products and agricultural or forest products in the construction thereof, when such products are to be used in such construction, addition or repair, and if such use is reasonable and available pursuant to the applicable state law.

(b) These provisions shall not apply when in conflict with Federal law, rules, and regulations concerning interstate commerce or construction.

PART 3 – OWNER'S GENERAL RESPONSIBILITIES AND RIGHTS

1.3.1 Owner's Representative.

1.3.1.1 Written Designation. The Owner shall designate, in writing, a representative authorized to act on the Owner's behalf with respect to the Project. The Owner reserves the right to designate additional or replacement representatives by written notice to the Contractor.

1.3.1.2 Accessibility. The Owner's Representative shall be readily accessible (either on site or by computer, phone, fax or otherwise), shall be well acquainted with the Project, and shall have authority promptly to render decisions and to furnish information required of, or to be provided by, the Owner hereunder.

1.3.1.3 Independent Review and Inspection. The Owner may undertake independent inspection of the installation of the Work. Such independent inspector shall operate on behalf of the Owner and shall act to protect the best interests of the Owner.

1.3.2 Design Professional.

1.3.2.1 Design Professional to Design Work. The Design Professional Contract requires the Design Professional to design and to prepare the Contract Documents, a copy of which shall be furnished to the Contractor upon request. The Design Professional Contract requires the Design Professional to designate a readily accessible representative (either on Site or by computer, phone or fax or otherwise) who shall have authority promptly to render decisions and to furnish information required of the Design Professional. The Design Professional is the interpreter of the conditions of the Construction Contract and the judge of its performance, in the first instance.

1.3.2.2 Construction Contract Administration. The Design Professional shall provide periodic review of the Work to assess compliance with the Contract Documents. The Design Professional shall not review any Work in respect to safety. The Design Professional is not the agent of the Owner, but is engaged as a consultant to the Owner to assist the Owner in determining if the conditions of the contract have been met. He has authority to stop the Work whenever such stoppage may be necessary to enforce the proper execution of the Contract. The Design Professional shall side neither with the Owner nor with the Contractor, but shall use its powers to enforce performance by both.

(a) Promptness. The Design Professional shall make decisions within fourteen calendar days after proper presentation of evidence on (1) any issue, claim, or dispute of the Owner or Contractor, or (2) a demand of the Owner or Contractor for a decision on any matter relating to the execution or progress of the Work.

(b) Additional Time. If because of events beyond the Design Professional's reasonable control, it is not able to meet the specified time period, then it should be entitled to ask the Owner for additional time, which request shall not be unreasonably denied.

(c) Protests of Design Professional's Decisions. All decisions of the Design Professional on any claim, dispute, or demand shall be final and binding on the Contractor in the absence of written notice of protest from

the Contractor received by the Owner within fourteen calendar days of the date of the decision of the Design Professional is received by the contractor. See Section 5 Part 2.

(d) Aesthetics. All decisions of the Design Professional on matters of aesthetics are final, conclusive, and binding on all parties if consistent with the requirements of the Contract Documents.

(e) Permits, Licenses, and Inspections. The Design Professional and Owner shall cooperate with the Contractor in obtaining building and other permits, licenses, and inspections.

1.3.3 Testing. The Owner shall provide, normally through the Design Professional, and pay for initial and subsequent independent construction testing as required at the Project Site by the Contract Documents. Laboratories for testing services shall be selected by, engaged by, and responsible to the Design Professional, Program Manager, if any, and the Owner. In the case of tests (a) prescribed in the Contract Documents or any part thereof, or (b) requested by the Owner or Design Professional, the Contractor must give notice to the selected testing agency stating the date and the hour when he will be ready for the test to be made. In the event the test fails or the Contractor is not ready for the test, the expense of the services of the testing laboratory shall be deducted from the Contract Sum, upon notice to the Contractor by the Owner accompanied by a copy of the invoice for the testing services for the test that failed or for which the Contractor was not ready. The notice and readiness provisions of this article do not apply to verification of design mix on concrete.

1.3.4 Owner's Independent Consultants. In the event the Owner, it its sole discretion, shall either itself perform or retain one or more independent consultants to provide peer review, expert opinion, or other analysis of design, the Construction Documents, or construction as performed in the field, the CM/GC agrees that any such review or analysis shall not constitute any admission concerning the adequacy, fitness, or completeness of the design, the Construction Documents, or the adequacy or compliance of the construction to the specifications. Such consultant reports are expert opinion rendered solely to the Owner and shall not be used in connection with any claim or legal action arising out of or related to the Project without the express written consent of the Owner, unless required by the provisions of the Civil Practice Act governing the designation and use of expert witnesses.

1.3.5 No Partial Occupancy. There shall be no partial occupancy by the Using Agency of the Project prior to the achievement of Material Completion. This provision may be modified in the Supplementary General Conditions only for phased construction projects with stand-alone components, or may be modified by Change Order.

1.3.6 Disqualification of Potential "Pre-Qualified" Subcontractors. The Owner may disqualify for just cause any pre-qualified potential subcontractors identified in the Bidding Documents. Owner shall pay any difference in the cost of the Work resulting from such disqualification.

1.3.7 Owner's Right to Perform Work. The Owner reserves the right to perform construction or operations related to the Project with Separate Contractors on the Site. If the Contractor claims that delay or additional cost is because of such action by the Owner, the Contractor shall assert such claims as provided in Section 5, Part 2 of the General Conditions.

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PART 4 – PROTECTION OF PERSONS AND PROPERTY

1.4.1 Reasonable Precautions. The Contractor shall take reasonable precautions for the safety of, and shall provide reasonable protection to prevent damage, injury or loss to: (a) employees performing the Work and other persons, including without limitation the General Public, who may be affected thereby; (b) the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site, under care, custody, or control of the Contractor or the Contractor's Subcontractors; or (c) other property at or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation, replacement or other rearrangement in the course of construction.

1.4.2 Duty to Protect Property. The Contractor shall continuously maintain adequate protection of the Work from damage and shall protect all other property on the Site from damage, injury, or loss regardless of who may be the owner of said property. He shall make good any such damage, injury, or loss.

1.4.3 Safety Precautions. The Contractor shall comply with the rules and regulations of OSHA and the Department of Labor (O.C.G.A. Section §34-2-6), and, where not inconsistent with the foregoing, the "Manual of Accident Prevention in Construction" issued by the Associated General Contractors of America, Inc., for safety and prevention of accidents, and shall maintain an accurate record of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work arising out of and in the course of employment on work under the Contract. The Contractor alone shall be responsible for the safety, efficiency, and adequacy of his plant, appliances, and methods, and for any damage that may result from their improper construction, maintenance, or operations. He shall erect and properly maintain at all times, as required by the conditions and progress of the Work, proper safeguards for the protection of workers and the public and shall post danger warnings against any hazards created by the construction operations. The Contractor shall designate a responsible member of his organization, normally the superintendent, whose duty shall be the prevention of accidents.

1.4.4 Emergencies. In an emergency affecting the safety of persons or property or the Work or of adjoining property, the Contractor shall take reasonable precautions to prevent imminent damage, injury, or loss.

1.4.5 Fire Protection. Contractor shall take adequate and reasonable precautions to protect the Work against damage by fire and smoke. For example, without limitation, Contractor shall do the following:

(a) Provide fire extinguishers or fire hoses in readily accessible locations;

(b) Periodically inspect fire extinguishers, remove discharged extinguishers immediately, and replace with new or recharged extinguishers;

(c) Keep fire extinguishers or fire hoses within five (5) feet of any welding or open flame operations;

(d) Remove oil-soaked and paint-soaked materials, including paper and rags, from the Site daily, and more frequently as necessary, to eliminate danger of fire.

(e) Prohibit workers from smoking during operations involving combustible adhesives, solvents, mastics, or other fire hazard materials.

1.4.6 Remedy Damages. The Contractor shall promptly remedy damages and loss to property at the Site caused by the Contractor, by any Subcontractor, by anyone directly or indirectly employed by the Contractor or any such Subcontractor, or by anyone for whose acts the Contractor or any such Subcontractor may be liable. Should the Contractor cause damage to any Separate Contractor‘s work, the Contractor agrees, upon due notice, to settle with the Separate Contractor.

1.4.7 Written Programs. Contractor shall have written environmental, quality control, crisis/emergency management, health and safety programs in place with a designated (qualified) coordinator as the point of contact during the project. Such plans shall be on the Site and the superintendent and the project management team shall be familiar with and utilize such programs.

PART 5 – BONDS, INDEMNITY, AND INSURANCE

1.5.1 Bonds

1.5.1.1 Performance Bond and Payment Bond. The Contractor shall furnish both a performance bond and a payment bond in the exact form set forth in Section 7, (Forms) of these General Conditions.

1.5.1.2 Required Qualifications for Surety. The Contract provides that the surety and insurance companies must be acceptable to the Owner. Only those sureties listed in the Department of Treasury's Listing of Approved Sureties (Department Circular 570) are acceptable to the Owner. All bonds at the time of issuance must be issued by a company authorized by the Insurance Commissioner to transact the business of suretyship in the State of Georgia, and shall have a Best Policyholders Rating of "A-" or better and with a financial size rating of Class V or larger.

1.5.1.3 Penal Amount of Bonds, State Law. The Contractor acknowledges and agrees that, pursuant to O.C.G.A. §§13-10-2, 13-10-20, 13-10-40 and 13-10-60, the performance bond and the payment bond must be in a penal amount equal to at least 100% of the Contract Sum. Accordingly, the Contractor warrants and agrees that, for any Change Order increasing the Contract Sum by five percent or more or when the total cost of the work has increased by five percent or more, it shall obtain a written amendment to the payment bond and the performance bond increasing the penal amounts of both bonds to 100% of the Contract Sum, effective as of the date of the Change Order. The premium increase, if any, may be properly included in the cost of the Change Order. The Design Professional shall approve no payment for the work provided by the Change Order until the Contractor has provided the written amendment to the Owner.

1.5.2 Liability and Indemnification.

1.5.2.1 General Liability. The Contractor shall be responsible to the Owner from the time of the signing of the agreement or the beginning of the first work, whichever shall be earlier, for all injury or damage of any kind resulting from any negligent act or omission or breach, failure or other default regarding the Work by the Contractor, or any of its Subcontractors, its agents, employees or others working at the direction of the Contractor or on its behalf, regardless of who may be the owner of the property.

1.5.2.2 Indemnification Agreement. Contractor hereby agrees to indemnify and hold harmless the Owner, the State of Georgia and its departments, agencies and instrumentalities and all of their respective officers, members, employees and directors (hereinafter collectively referred to as the "Indemnitees") from and against any and all claims, demands, liabilities, losses, costs or expenses, including attorneys' fees, due to liability to a third party or parties, for any loss due to bodily injury (including death), personal injury, and property damage arising out of or resulting from the performance of this Contract or any act or omission on the part of the Contractor, its agents, employees or others working at the direction of Contractor or on its behalf., or due to any breach of this Contract by the Contractor, or due to the application or violation of any pertinent Federal, State or local law, rule or regulation. This indemnification extends to the successors and assigns of the Contractor. This indemnification obligation survives the termination of the Contract and the dissolution or, to the extent allowed by law, the bankruptcy of the Contractor. If and to the extent such damage or loss (including costs and expenses) as covered by this indemnification is paid by the State Tort Claims Trust Fund, the State Authority Liability Trust Fund, the State Employee Broad Form Liability Fund, the State Insurance and Hazard Reserve Fund, and other self-insured funds (all such funds hereinafter collectively referred to as the "Funds") established and maintained by the State of Georgia Department of Administrative Services Risk Management Division (hereinafter "DOAS") the Contractor agrees to reimburse the Funds for such monies paid out by the Funds.

1.5.2.2.1 This indemnification does not extend beyond the scope of this Contract and the work undertaken thereunder. Nor does this indemnification extend to claims for losses or injuries or damages incurred directly by the Indemnitees due to the sole negligence of any Indemnitee.

1.5.2.2.2 This indemnification does not extend to claims for loses or injuries or damages incurred by the Indemnitees due to any negligent act, error, or omission of a design professional in the performance of professional services that fails to meet the applicable professional standard of care, skill and ability as employed by others in their profession.

1.5.2.3. DOAS. Risk Management will endeavor to notify affected insurers of claims made against the State that fall within this indemnity. In the event of litigation, the Attorney General will endeavor to keep the Contractor and its general liability insurer as named on the insurance certificate informed regarding the claims and settlement.

1.5.3 Insurance Requirements.

1.5.3.1 Insurance Certificates and Required Endorsements.

1.5.3.1.1 Insurance Certificates. The CM/GC shall procure the insurance coverages identified below at the CM/GC's expense (e.g. within GMP) and shall furnish the Owner an insurance certificate listing the Owner as the certificate holder and as an additional insured. Evidence of insurance coverages shall be provided on the Certificate of Insurance shown in Section 7 or on a similar form approved for use by the Georgia Commissioner of Insurance that provides following:

(a) Name and address of authorized agent
(b) Name and address of insured
(c) Name of insurance company(ies)
(d) Description of policies
(e) Policy Number(s)
(f) Policy Period(s)
(g) Limits of liability
(h) Name and address of Owner as certificate holder
(i) Project Name and Number
(j) Signature of authorized agent
(k) Telephone number of authorized agent
(l) Mandatory thirty day notice of cancellation or non-renewal (except ten days for non payment of premium).

1.5.3.1.2 Special CGL Endorsement. The CM/GC shall cause its insurer to issue a special endorsement amending the definition of insured contract and identifying this Project on the schedule of covered projects. The Using Agency name should be entered in the blank and the special endorsement attached to the Certificate of Insurance.

1.5.3.1.3 Additional Insured Endorsement. The CM/GC shall cause its insurer to issue an additional insured Endorsement on ISO Form CG 20 10 11 85 ("Additional Insured – Owners, Lessees or Contractors – Scheduled Person or Organization") naming the officers, members and employees of the Owner and the Using Agency. If the insurer uses ISO Form CG 20 10 only, then the form must expressly provide for continued operations coverage and provide substantially similar coverages as ISO Form CG 20 10 11 85.

1.5.3.2 Insurer Qualifications, Insurance Requirements. Each of the insurance coverages required below (i) shall be issued by a company licensed by the Insurance Commissioner to transact the business of insurance in the State of Georgia for the applicable line of insurance, and (ii) shall be an insurer (or, for qualified self-insureds or group self insureds, a specific excess insurer providing statutory limits) with a Best Policyholders Rating of "A-" or better and with a financial size rating of Class V or larger. Each such policy shall contain the following provisions:

1.5.3.2.1 The insurance company agrees that the policy shall not be canceled, changed, allowed to lapse or allowed to expire until thirty days after the Owner has received written notice thereof, as evidenced by return receipt of certified mail or statutory mail, or until such time as other insurance coverage providing protection equal to protection called for in this Contract shall have been received, accepted and acknowledged by the Owner. Such notice shall be valid only as to the Project as shall have been designated by Project Number and Name in said notice.

1.5.3.2.2 The policy shall not be subject to invalidation as to any insured by reason of any act or omission of another insured or any of its officers, employees, agents or other representatives ("Separation of Insureds").

1.5.3.2.3 Each Insurer is hereby notified that the statutory requirement that the Attorney General of Georgia shall represent and defend the Indemnities remains in full force and effect and is not waived by issuance of any policy of insurance. In the event of litigation, any settlement on behalf of the indemnities must be expressly approved by the Attorney General. The Contractor and its insurance carrier may retain, but are not obligated to retain, counsel to assist with the defense of the Indemnities, in which case there will be mutual cooperation between the Attorney General and such counsel. See O.C.G.A. § 45-15-12.

1.5.3.2.4 All deductibles shall be paid for by the Contractor.

1.5.3.2.5 Self-insured retention, except for qualified self-insurers or group self-insurers, in any policy shall not exceed $100,000.00.

1.5.3.3 Required Insurance Coverages. The Contractor also agrees to purchase insurance and have the authorized agent state on the insurance certificate that the Contractor has purchased the following types of insurance coverages, consistent with the policies and requirements of O.C.G.A. §50-21-37. The minimum required coverages and liability limits are as follows:

1.5.3.3.1 Workers' Compensation Insurance. The Contractor agrees to provide at a minimum Workers' Compensation coverage in accordance with the statutory limits as established by the General Assembly of the State of Georgia. A group insurer must submit a certificate of authority from the Insurance Commissioner approving the group insurance plan. A self-insurer must submit a certificate from the Georgia Board of Workers' Compensation stating the Contractor qualifies to pay its own workers' compensation claims. The Contractor shall require all Subcontractors performing work under this Contract to obtain an insurance certificate showing proof of Workers' Compensation Coverage and shall submit a certificate on the letterhead of the Contractor in the following language:

This is to certify that all subcontractors performing work on this Project are covered by their own workers' compensation insurance or are covered by the Contractor's workers' compensation insurance.

1.5.3.3.2 Employers' Liability Insurance. The Contractor shall also maintain Employer's Liability Insurance Coverage with limits of at least:

(i)	Bodily Injury by Accident	$1,000,000 each accident;
(ii)	Bodily Injury by Disease	$1,000,000 each employee; and
(iii)	Bodily Injury/Disease Aggregate	$1,000,000 each accident.

The Contractor shall require all Subcontractors performing work under this Contract to obtain an insurance certificate showing proof of Employers Liability Insurance Coverage and shall submit a certificate on the letterhead of the Contractor in the following language:

This is to certify that all subcontractors performing work on this Project are covered by their own Employers Liability Insurance Coverage or are covered by the Contractor's Employers Liability Insurance Coverage.

1.5.3.3.3 Commercial General Liability Insurance. The Contractor shall provide Commercial General Liability Insurance (2002 or 2003 ISO Occurrence Form or equivalent) that shall include, but need not be limited to, coverage for bodily injury and property damage arising from premises and operations liability, products and completed operations liability, blasting and explosion, collapse of structures, underground damage, personal injury liability and contractual liability. The CGL policy must include separate aggregate limits per Project and shall provide at a minimum the following limits:

	Coverage	***Limit***
1.	Premises and Operations	$ 1,000,000.00 per Occurrence
2.	Products and Completed Operations	$ 1,000,000.00 per Occurrence
3.	Personal Injury	$ 1,000,000.00 per Occurrence
4.	Contractual	$ 1,000,000.00 per Occurrence
5.	General Aggregate	$ 2,000,000.00 per Project

Additional Requirements for Commercial General Liability Insurance are shown below at Paragraph 1.5.3.3.6.

1.5.3.3.4 Commercial Business Automobile Liability Insurance. The Contractor shall provide Commercial Business Automobile Liability Insurance that shall include coverage for bodily injury and property damage arising from the operation of any owned, non-owned, or hired automobile. The Commercial Business Automobile Liability Insurance Policy shall provide not less than $1,000,000 Combined Single Limits for each accident. Additional Requirements for Commercial Business Automobile Liability Insurance are shown below at Paragraph 1.5.3.3.6.

1.5.3.3.5 Commercial Umbrella Liability Insurance. The Contractor shall provide a Commercial Umbrella Liability Insurance to provide excess coverage above the Commercial General Liability, Commercial Business

Automobile Liability and the Workers' Compensation and Employers' Liability to satisfy the minimum limits set forth herein. The umbrella coverage shall follow form with the Umbrella limits required as follows:

For Contract Amounts Less Than $5,000,000.00:	**For Contract Amounts Equal to or Greater than $5,000,000:**
$ 2,000,000 per Occurrence	$2,000,000 per Occurrence
$ 4,000,000 Aggregate	$10,000,000 Aggregate

Additional Requirements for Commercial Umbrella Liability Insurance are shown below at Paragraph 1.5.3.3.6.

1.5.3.3.6 Additional Requirements for Commercial Policies in Paragraphs 1.5.3.3.3 through 1.5.3.3.5

(a) The policy shall name as additional Insureds the officers, members, and employees of the Owner and the Using Agency.

(b) The policy must be on an "occurrence" basis.

1.5.3.3.7 Builders Risk Insurance. Contractor shall provide a Builder's Risk Policy to be made payable to the Owner and Contractor, as their interests may appear. The policy amount should be equal to 100% of the Contract Sum or $2,000,000 (whichever is greater), written on a Builder's Risk "All Risk", or its equivalent. The policy shall be endorsed as follows:

The following may occur without diminishing, changing, altering or otherwise affecting the coverage and protection afforded the insured under this policy:

(i) Furniture and equipment may be delivered to the insured premises and installed in place ready for use; and

(ii) Partial or complete occupancy by Owner; and

(iii) Performance of work in connection with construction operations insured by the Owner, by agents or lessees or other Contractors of the Owner or Using Agency

In the event that the Contract is for renovation, addition or modification of an existing structure and Builders Risk Insurance is not available, the Owner will accept an Installation Floater Insurance Policy with the above endorsements in lieu of the Builders' Risk Insurance Policy. Such floater must insure loss to materials and equipment prior to acceptance by Owner and must be on an ALL RISK BASIS with the policy written on a specific job site.

1.5.3.3.8 Disposition of Insurance Documents. One original certificate of insurance with all endorsements attached must be deposited with Owner for each insurance policy required.

1.5.3.4 Termination of Obligation to Insure. Unless otherwise expressly provided to the contrary, the obligation to insure as provided herein shall not terminate until the Design Professional shall have executed the Certificate of Material Completion.

1.5.3.5 Failure of Insurers. The Contractor is responsible for any delay resulting from the failure of his insurance carriers to furnish proof of proper coverage in the prescribed form.

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PART 6 – HAZARDOUS CONDITIONS AND MATERIALS

1.6.1 Hazardous Materials.

1.6.1.1 Definition. The term "Hazardous Materials shall mean any material or substance within the meaning and definition for "Hazardous Substance" and/or "Hazardous Waste" and/or "Pollutant" and/or Contaminant as those terms are employed and set forth in the Georgia Hazardous Site Response Act and the Comprehensive Environmental Response Compensation and Liability Act as amended, 42 USC § 6901 et seq., and regulations promulgated thereunder (collectively "CERCLA") and any corresponding state or local law or regulation, and shall also include (a) such terms that are defined by, or are otherwise identified by, the Resource Conservation and Recovery Act as amended, 42 USC § 6901 et seq., and regulations promulgated thereunder (collectively "RCRA") and any corresponding state or local law or regulation; (c) crude oil, petroleum and fractions of distillates thereof and petroleum releases ; (d) any other material, substance or chemical defined, characterized or regulated as toxic or hazardous under any applicable law, regulation, ordinance, directive or ruling, including, but not limited to, Asbestos or polychlorinated biphenyl (PCB),and, (e) any infectious or medical waste or environmental contamination as defined by any applicable federal or state laws or regulations. The term "Hazardous" Materials does not include those materials that are expressly and specifically required to be installed under the Contract Documents nor includes products or materials that are commonly used in construction or industrial practice so long as they are used in accordance with the product's manufacturer's instructions or Material Safety Data Sheets.

1.6.1.2 Obligations When Encountering Hazardous Materials. The Contractor shall immediately notify the Owner and the Design Professional, both orally and in writing, of the presence and location of any Hazardous Materials at the Site of which it becomes aware and shall (i) immediately stop performance of Work affected by or affecting such Hazardous Materials; (ii) secure the contaminated area against intrusion; (iii) not disturb or remove the Hazardous Materials; (iv) not proceed with any Work or other activities in the area affected by such Hazardous Materials; and, (v) take any other steps necessary to protect life and health and the surrounding environment. The Contractor shall be entitled to adjustment of the Contract Time and the Contract Sum to compensate for the impact of any required demolition, re-work, shutdown, delay, disruption, and start-up resulting from such Hazardous Materials for which the Contractor is not responsible.

1.6.1.3 Prohibition Against Selecting and Installing Products Containing Hazardous Materials. The Contractor shall not select, install or otherwise incorporate any products or materials containing Hazardous Materials within the boundaries of the Site. Should the Contractor or any Subcontractors have knowledge that, or believe that, an item, component, material, substance, or accessory within a product or assembly selected by the Contractor or any Subcontractor may contain Hazardous Materials it is the Contractor's responsibility to secure a written certification from the manufacturer of any suspected material which identifies the specific Hazardous Material(s) contained, together with the Material Safety Data Sheets (MSDS) for such materials which shall be submitted to the Owner and Design Professional.

1.6.1.4 Fill, Backfill and Landscaping. No soil found on Site, or transported to the Site from remote locations, which contains debris or waste or Hazardous Materials shall be used for fill, backfill or landscaping topsoil.

1.6.2 Responsibility and Warranty of Subcontractors, Trade Contractors and Suppliers. Products that are specified by reference standards or in descriptive manner without a manufacturer's name, model number or trade name, to be selected by the Contractor shall not contain Hazardous Materials in any form, except as allowed by Articles 1.6.1 and 1.6.3. The Contractor shall require that each of its Subcontractors and Suppliers warrant to the Owner and Design Professional that all materials, products and assemblies, other than those which specifically and expressly required by the Contract Documents, incorporated, or submitted for incorporation into this Project, are free of Hazardous Materials. This warranty shall also include all materials, components, and accessories not specifically enumerated or detailed in the Contract Documents but which are required by performance specifications or recommended by manufacturers for complete installation of materials, products and assemblies.

1.6.3 Hazardous Materials and Substances Used On the Job Site. Products containing Hazardous Materials may be employed in the performance of the Work provided that: (i) such products are used In accordance with the manufacturer's instructions and Material Safety Data Sheets; (ii) such products are rendered harmless upon completion of the affected Work; (iii) reasonable precautions can be and are taken to prevent foreseeable bodily injury or death to persons involved in the Work or in its proximity, including the ultimate users of the completed Work; (iv) the Contractor shall make available to the Owner and the Design Professional the Material Safety Data Sheets (MSDS) for any such products used on the Site, and (v), the Contractor shall immediately notify Owner, Design Professional and appropriate regulatory agencies if there is a spill or release or misuse of any such product used on the Site that exceeds State or Federal reportable limits.

1.6.4 Other Hazardous Conditions. Previously unknown hazardous conditions not involving Hazardous Materials may be encountered at any job site, and in particular where existing structures are being demolished and/or remodeled. Should such hazardous conditions be encountered on the Site, and if reasonable safety precautions are deemed to be inadequate to prevent foreseeable personal injury to persons or workers, the Contractor shall stop work in the affected area and report the hazardous condition to the Design Professional and Owner in writing. So long as the hazardous condition did not result from activities or substances brought on the Site by the Contractor, he parties shall seek to mutually resolve the condition and the Contractor shall be entitled to adjustments in the Contract Time and the Contract Sum as set forth in Paragraph 1.6.1.2 above.

PART 7 – MISCELLANEOUS PROVISIONS

1.7.1 Legal Compliance.

1.7.1.1 General. This Contract shall be governed by the law of Georgia. The Contractor shall comply with all laws, rules, regulations, ordinances, and orders of any government agency having jurisdiction in the performance of the Work and shall ensure the compliance of its Subcontractors.

1.7.1.2 Specific Laws. Without limiting the generality of the foregoing Paragraph, the following laws are specifically referenced:

(a) The Drug-Free Workplace Act, O.C.G.A. § 50-24-1, *et seq.*
(b) Preference for Georgia Supplies, materials, equipment, and agricultural products, O.C.G.A. §§50-5-60 through 61.
(c) Preference for Georgia forest products, O.C.G.A. § 50-5-63.
(d) Preference for local sellers of Georgia products, O.C.G.A. § 50-5-62.
(e) Standards and Requirements for Construction, Alterations, etc., O.C.G.A. § 8-2-1 *et seq.*
(f) Control of Soil Erosion and Sedimentation, O.C.G.A. § 12-7.1, *et seq.*
(g) Regulation of Fire and other Hazards, O.C.G.A. § 25-2-1 *et seq.*
(h) Regulation of Blasting Operations, O.C.G.A. § 25-2-1 *et seq.* and 25-9-1 *et seq.*
(i) Providing safe workplace, O.C.G.A. §s 34-2-10 and 34-7-20
(j) Georgia Facility Protection Act, O.C.G.A. § 25-9-1 *et seq.* (See Article E-12(f))
(k) High Voltage Safety Act, O.C.G.A. § 46-3-30 *et seq.*
(l) Access and Use by Physically Handicapped Persons, O.C.G.A. § 30-3-1 *et seq.*
(m) Small and Minority Business Enterprises, O.C.G.A. §s 50-5-120 *et seq.* and 50-5-130 *et seq.*
(n) Trading with the State or State Officials, O.C.G.A. §s 45-10-20 to 45-10-71.
(o) Title VII of the Civil Rights Act, 42 U.S.C. § 2000a through 2000h-6
(p) Age Discrimination in Employment Act, 29 U.S.C. § 621 *et seq.*; 42 U.S.C. § 6101 *et seq.*
(q) Americans with Disabilities Act, 42 U.S.C. § 12101 *et seq.*
(r) Federal Occupational Safety and Health Act, 29 U. S. C. § 651 *et seq.*
(s) Federal Emergency Planning and Community Right-to-Know Act, 42 U. S. C. § 11001 *et seq.*
(t) Georgia Open Records Act, O.C.G.A. §50-18-70 *et seq.*
(u) Georgia Blasting Standards Act, O.C.G.A. § 25-8-1 *et seq.* and Blasting, Excavating Nearby Underground Gas Pipes and Utilities, 25-9-1 *et. seq.*
(v) Scaffolding and Staging Statute, O.C.G.A. §34-1-1 *et seq.*
(w) Department of Labor Rules and Regulations, O.C.G.A. § 34-2-6 *et seq.*
(x) Hazardous Chemical Protection and Right to Know Act, O.C.G.A. § 45-22-2 *et seq.*,
(y) Retainage on Public Works Contracts, 0.C.G.A. §13-10-80 *et seq.*
(z) Compliance with "federal work authorization programs" and federal Immigration Reform and Control Act of 1986 by Georgia Public Employers, contractors and subcontractors, O.C.G.A. §13-10-90 *et seq.*
(aa) Special compliance requirements ONLY for ARRA funded Projects:
  (i) American Recovery and Reinvestment Act of 2009
  (ii) Federal Funding Accountability and Transparency Act of 2006
  (iii) Davis-Bacon Wage Act

1.7.1.3 Building Codes. The following Building Codes, in the latest editions approved by the Georgia Department of Community Affairs, shall be used. (*See* O.C.G.A. §8-2-20.) The Design Professional will designate any additional codes or special modifications in the Supplementary General Conditions. As of the year 2000, these codes are published jointly by the Southern Building Code Congress International, the International Code Council, the Building Officials and Code Administrators, International, and the International Conference of Building Officials, and are commonly referred to as the International Building Codes, with the associated Georgia Amendments. *See also* http://www.dca.state.ga.us/development/constructioncodes/programs/codes2.asp

1.7.2 Surveys, Permits, and Regulations. The Owner shall furnish all surveys unless otherwise specified. Permits and licenses of a temporary nature necessary for the prosecution of the Work shall be obtained and paid for by the Contractor. Permits, licenses, and easements for permanent structures or permanent changes in existing facilities shall be obtained and paid for by the Owner unless otherwise specified. The Contractor and its Subcontractors must pay any municipal or county occupational licenses, taxes, or fees, if any. The Contractor shall give all notices and comply with all laws, ordinances, rules, and regulations bearing on the conduct of the Work. If the Contractor observes that the drawings or specifications are at variance with any such laws, ordinances, rules or regulations, he shall promptly notify the Owner and Design Professional in writing, and any necessary changes shall be adjusted as provided in the Contract for changes in the Work. If the Contractor performs any Work knowing it to be contrary to such laws, ordinances, rules or regulations without such notice to the Owner, he

shall bear all costs arising therefrom. Nothing in this paragraph shall be construed to impose design responsibility on the Contractor except as noted in the Contract Documents.

1.7.3 Open Records Act. Owner and Design Professional and Contractor acknowledge and agree that all records of the project and the Work, including records of Subcontractors, are subject to the Georgia Open Records Act, O.C.G.A. §50-18-70 et seq., with particular attention being called to O.C.G.A. §50-18-70(a) regarding the records of private persons, firms, corporations, or other private entity engaged in performance of services or functions on behalf of a state agency, public agency or public office.

1.7.4 Revocable License and Use of Site. The Contractor has a revocable license to come on, use, and perform Work upon the Premises, shall confine thereto his plant, his apparatus, the staging and storage of materials, the operations of his forces and the Work to limits indicated by law, ordinances, permits, or the Contract Documents, and shall not unreasonably encumber the Premises with his materials. The Contractor shall not load or permit any part of the Work to be loaded with weight that will endanger its safety. The Contractor shall enforce Contract requirements regarding signs, advertisements, fires, and smoking and shall remove from the Premises and properly dispose all trash and debris.

1.7.6 Utilities. Pending the extension and connection of permanent water, permanent gas, permanent sewer taps, and permanent electric power, the Contractor shall obtain temporary water, temporary gas, temporary electric power, and provide sewage disposal at his own expense. In the absence of provisions to the contrary, the Contractor shall pay for all utilities services until Material Completion has been achieved.

1.7.7 Royalties and Patents. The Contractor shall pay all royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and shall save the Owner harmless from loss on account thereof. The Owner shall defend and be responsible for all such loss when a particular process or the product of a particular manufacturer or manufacturers is specified.

1.7.8 Women, and Disadvantaged Business Participation.

1.7.8.1 Good Faith Efforts. Contractor shall, to the extent consistent with quality, price, risk and other lawful and relevant considerations, use its good faith efforts to achieve participation by minority, women, and disadvantaged business enterprise participation in Work and services contracted to Contractor under this Contract.

1.7.8.2 Policy of the State of Georgia. It is the policy of the State of Georgia that minority business enterprises shall have the maximum opportunity to participate in the State purchasing process. Therefore, the State of Georgia encourages all minority business enterprises to compete for, win, and receive Contracts for goods, services, and construction. In addition, the State encourages all companies to sub-contract portions of any State Contract to minority business enterprises. It is the wish of the Owner that minority businesses be given the opportunity to propose on the various parts of the Work. This desire on the part of the Owner is not intended to restrict or limit competitive selection or to increase the cost of the Work. The Owner supports a healthy free market system that seeks to include responsible businesses and provides ample opportunity for business growth and development.

1.7.8.3 Minority Vendor Designee. The minority vendor designee of the Owner shall be specified in the Supplementary General Conditions or the Instructions to Bidders. For more information, please contact the Board of Regents' Office of Business Development by e-mail at BusinessDevelopment@usg.edu.

1.7.9 Assignment. The Contractor shall not assign the Contract or sublet it as a whole nor shall the Contractor assign any moneys due or to become due to him hereunder. Contractors may subcontract portions of the Work, normally performed by Subcontractors.

1.7.10 Energy Efficiency and Sustainable Construction Act of 2008. The following services are to be provided by the Design Professional if this project is subject to the Georgia Energy Efficiency and Sustainable Construction Act of 2008 ("Energy Act"). See paragraph 9 of the Contract to determine if the Energy Act is applicable.

1.7.10.1 Georgia Based Materials and Products. The project is required to be designed so that not less than 10 percent of all building materials used in the project are materials that are harvested, extracted, or manufactured in the State of Georgia where such products are commercially available. The Contractor shall track the value of all Georgia based materials installed in the project. Contractor shall provide documentation to ensure compliance with the requirement and shall complete the Georgia-Based Materials and Products Checklist to certify compliance with the requirement.

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SECTION 2 – PRE-COMMENCEMENT PHASE

PART 1 – PRE-COMMENCEMENT PHASE SERVICES

2.1.1 Pre-commencement Coordination. As early as practicable and reasonably in advance of the commencement of Work on the Project, the Contractor shall schedule and conduct an initial construction coordination meeting for the purpose of determining and developing the appropriate and necessary processes and procedures for proper planning and coordination for the installation of all the Work. The meeting shall include all of the Subcontractors, Trade Contractors and Suppliers materially involved in such installation of the Work. The Owner and Design Professional shall be represented at this initial meeting. If necessary, additional meetings shall be scheduled by the Contractor with all of the affected parties to continue review and resolution of any apparent conflicts or interferences.

2.1.2 Construction Preparation Period.

2.1.2.1 Requirement for Project Planning. No physical work will begin on the construction site until the receipt of a Proceed Order issued by the Owner. The Contract assumes that a Proceed Order will be issued in not more than sixty days from the Effective Date of the Contract. Failure of the Contractor to provide the necessary documentation for the issuance of a Proceed Order shall not entitle the Contractor to any extension of time. If a Proceed Order is not issued within sixty days from the award of the Contract and non-issuance is due to nonperformance by the Contractor, the Contractor may be in default.

2.1.2.2 Copies of Contract Documents. Without charge to the Contractor, the Design Professional shall furnish to the Contractor upon request up to ten sets of completed Contract Documents in hard copy, one set of reproducible and electronic background floor and reflected ceiling plan drawings, and one copy in read-only electronic format. The Contractor may obtain such additional sets of Contract Documents as the Contractor deems necessary, and shall pay the cost of reproduction and/or service charges of such additional sets to the Design Professional or reprographics services provider.

2.1.2.3 Timing of Submission of Documents. No Proceed Order shall be issued until the Owner has received, in good and proper order, the following documents. The documents shall be submitted in accordance with the following schedule:

(a) Within ten days of the Notice of Apparent Successful Bid:

- Contract executed by Contractor
- Payment and Performance Bonds in accordance with Article 1.5.1

(b) Within fourteen days of the Effective Date of the Contract:

- Proof of Insurance as required in Paragraph 1.5.3.1
- List of intended Subcontractors

(c) Prior to the issuance of the Proceed Order, but in any event, within sixty days of the Effective Date of the Contract:

- Submittal and Shop Drawing Schedule as required in Article 2.2.3
- Construction Progress Schedule as required in Article 2.1.5
- Documents Review Report as required in paragraph 2.1.2.3
- Construction Management Plan as required in Article 2.1.3
- Documentation necessary for receiving land disturbance permits, See Article 2.2.5
- Contractor's Quality Control Program as required in Article 2.1.4
- Written Safety Program as required in Article 1.4.7
- Contractor's Schedule of Rental Rates and Wage Rates

2.1.2.4 Document Review and Verification. Within one business day of receipt of the Effective Date of the Contract Contractor shall commence a review of the plans and Specifications, to identify conflicts, omissions, or constructability issues in the documents. Contractor shall prepare a report containing a list of issues and suggested modifications identified and shall provide a copy of the report to the Design Professional and the Owner prior to the end of the Construction Preparation Period

2.1.3 Construction Management Plan. Contractor shall prepare and furnish to the Owner a thorough and complete plan for the management of the Project from issuance of the Proceed Order through the issuance of the Design Professional's Certificate of Material Completion. Such plan shall include an estimate of the manpower requirements for each trade and the anticipated availability of manpower, a progress schedule as required in Article 2.1.5 below, and the Submittal Schedule as required in

Article 2.2.3. The Contractor shall include in his plan the names and resumés of the key personnel, such as Project Superintendent, Project Manager and the Project Safety Officer.

2.1.4 Quality Control Program. The Contractor acknowledges that he has full, total, and complete responsibility for providing materials, labor, and all other items necessary for providing the level of quality specified in the Contract Documents. In recognition of this, the Contractor's written Quality Control Program shall describe the means that will be used to ensure quality and the method provide review and verification of the proper installation of the Work. Each Subcontractor having responsibility for more than $100,000 of the contract cost shall be addressed in the plan.

2.1.5 Construction Progress Schedule; Overall Project Schedule. The Contractor shall submit for review by the Design Professional and approval by the Owner a Construction Progress Schedule based upon the Design Professional's Preliminary Design and Construction Schedule and prepared using a CPM (Critical Path Method), showing the dates for commencement and completion of the Work required by the Contract Documents, including coordination of mechanical, plumbing, and electrical disciplines, as well as coordination of the various subdivisions of the Work within the Contract. Milestones must be clearly indicated and sequentially organized to identify the critical path of the Project. The Construction Progress Schedule will be developed to represent the CSI specification divisions and shall be coordinated with the Submittal. Upon recommendation by the Design Professional and approval by the Owner, the Construction Progress Schedule shall become the Overall Project Schedule, which shall be utilized the parties for providing monthly updates of the progress of the Project indicating completed activities and any changes.

2.1.6 Progress Reports and Information. The Contractor shall submit monthly written progress reports in a format to be approved by the Owner. The reports shall include, but are not limited to, (a) dates by which specified Work will have been completed, (b) dates by which Non-compliant work will be made good, (c) dates that Non-compliant work has been made good, (d) written notice as to the date or dates by which Work that has not been performed and estimated dates when such Work has brought into conformity with the Overall Project Schedule, (e) advice regarding the nature and amount of any disputed claim of a Subcontractor, supplier, or laborer, (f) date on which any undisputed claim of a Subcontractor supplier, or laborer shall have been paid and (g) information regarding Work performed under Change Orders.

2.1.7 Rental Rates and Wage Rates for Change Orders. As soon as is practical, but prior to the completion of the Construction Preparation Period and in any event prior to the commencement of any Work on the Site, the Contractor shall submit in accordance with the style and format of a specimen to be furnished by the Owner for consideration of the Owner the following: (1) a proposal for rental rates on heavy construction equipment that shall apply in the event Change Order Work is performed, and (2) a proposal for wage rates for the types of project labor that shall apply in the event of the execution of any Change Order Work. Under penalty of false swearing, a principal of the contracting firm shall certify that the proposal for rental rates and proposal for wage rates do not exceed current costs for like services. The Owner will in no event consider a rental rate in excess of eighty percent of the rate set forth in the latest edition of the "Compilation of Nationally Averaged Rental Rates for Construction Equipment" of the Associated Equipment Distributors unless the rates proposed in excess of eighty percent are supported by proof satisfactory to the Owner that the excess rates are reasonable. If the equipment is owned by the Contractor the costs shall be charged at a maximum of eighty percent of market monthly rental rates for the amount of time used. If applicable, transportation costs may be included. The decision of the Owner shall be final, binding and conclusive on all parties. Rental rates shall be payable only for the actual time the equipment is required on the Site.

2.1.8 Unit Prices.

2.1.8.1 Unit Price Schedules. Prior to the completion of the Construction Preparation Period, the Contractor shall establish with the Owner Unit Prices not already bid. Examples include additional installation of stormwater management BMPs, any other anticipated Change Order Work that can utilize Unit Prices, or for any items of Work considered necessary by the Design Professional and not established in the Contract Documents.

2.1.8.2 Change Orders. Upon request of the Owner the Contractor shall submit written proposals for unit prices to be applied in the event unit price Change Order Work is authorized by the Owner.

2.1.8.3 Calculation of Unit Prices. Unit Prices include all sums for payment, repayment, reimbursement, remittance, remuneration, compensation, profit, cost, overhead, expense, loss, expenditure, allowance, charge, demand, hire, wages, salary, tax, cash, assessment, price, money, bill, statement, dues, recovery, restitution, benefit, recoupment, exaction, or injury. Unit prices to cover the addition or reinstallation of stormwater management BMPs shall be calculated by type and linear foot. Unit Prices *shall not* include any Time Dependent Overhead Costs, as such costs will be added as appropriate pursuant to Section 3, Part 3. The Contractor shall certify that the Unit Prices submitted do not exceed current costs in the industry or trade for like services or materials.

PART 2 – CONTRACT DOCUMENTS AND SITE PLAN

2.2.1 Contract Documents.

2.2.1.1 Familiarity with Contract Documents. Contractor shall review and become familiar with the Contract Documents, not later than the commencement of the construction phase.

2.2.1.2 Conflicts. The following general principles shall govern the settlement of disputes that may arise over conflicts in the Contract Documents: (a) as between figures given on drawings and the scaled measurements, the figures shall govern; (b) as between large-scale drawings and small-scale drawings, the larger scale shall govern; (c) as between the Contract and the Specifications, the requirements of the Contract, as executed, shall govern. Conflicts noted shall be reported to the Design Professional. Schedules, lists, indexes, tables, inventories, written instructions, written descriptions, summaries, statements, classifications, specifications, written selections, or written designations, although appearing on the drawings, are deemed to be and are Specifications.

2.2.1.6 Requests for Information (RFI). In the event the Contract Documents appear unclear or incomplete, the Contractor shall request the Design Professional in writing for additional information and instructions (an "RFI") and shall furnish the Owner a copy. With reasonable promptness but not more than five days thereafter, the Design Professional shall furnish written information and instruction, or drawings, or both. In the event such additional instructions are given orally for expediency, they shall be confirmed in writing or by drawings within five days following the oral instructions. The Work shall be executed in conformity with the response to the RFI. The Design Professional shall furnish the Owner a copy of all additional instructions issued to the Contractor. If, because of events beyond its reasonable control, the Design Professional is not able to meet the specified time period, then it is entitled to ask for additional time from the Owner.

2.2.1.8 Intellectual Property Rights in Construction Documents, Drawings, and Models. The drawings, Specifications and other documents prepared by the Design Professional pursuant to this Contract (including, without limitation, the Construction Documents), are the property of the Owner, whether or not the Project for which they are made commences or completes construction. Neither the Contractor nor any Subcontractor or material or equipment supplier shall own or claim a copyright in such drawings, Specifications, and other similar or related documents; Owner shall retain all common law, statutory, and other intellectual property rights with respect thereto. The Contractor must deliver remaining copies of such documents to the Owner upon request or upon completion of the Work, except that the Contractor may keep one copy of such documents for its files. Neither the Contractor nor any Subcontractor or material or equipment supplier may use such drawings, Specifications, and other documents on other projects without the specific written consent of the Owner. All models are the property of the Owner.

2.2.2 Documents at the Project Site. The Contractor shall keep at the Site at least one copy of the Contract Documents and Change Orders, all in good order and available to the Design Professional and to his representatives. The Contractor shall record all changes and shall annotate a copy of the drawings to reflect the as-built condition.

2.2.3 Submittals. Submittals required by the Contract Documents shall be prepared specifically for the Work by the Contractor to illustrate some portion of the Work. Submittals are not Contract Documents.

2.2.3.1 Submittal Schedule. Within sixty days after the Effective Date of the Contract, the Contractor shall prepare and submit a Submittal Schedule for review and approval of the Design Professional. In establishing the Submittal Schedule the Contractor shall take into account large submittal documents that will require longer review times, e.g., submittals with over fifty sheets of drawings. The Design Professional's approval shall be based on conformance of the Submittal Schedule with the Overall Project Schedule, subject to change from time to time in accordance with the progress of the Work.

2.2.3.2 Submission and Approval. The Contractor's Submittals must comply with the Contract Documents. The Contractor shall review and approve all Submittals prior to submission. The Contract Documents shall specify when shop drawings or submittals require the seal of a specialty consultant. The Contractor shall submit copies of Submittals as required by the Contract Documents for the Work of the various trades. The Design Professional shall review, approve, or take other appropriate action with respect to shop drawings, samples, or other submissions of the Contractor, including, but not limited to, confirming conformance with the design concept of the Project and with the Contract Documents. The Design Professional shall respond to and return said items to the Contractor within fourteen calendar days from receipt provided that the Submittals are submitted by the Contractor in accordance with the required Submittal schedule. The Design Professional shall review and give comment or approval to Submittal schedule within fourteen calendar days from receipt. Large submittal documents may require longer review times, e.g., submittals with over fifty sheets of drawings. If, because of events beyond its reasonable control, the Design Professional is not able to meet the specified time period, then it is entitled to ask for additional time from the Owner. The Contractor shall make all corrections required by the Design Professional and furnish such corrected copies as may be needed. If the Contractor believes that any corrections required by the Design Professional constitute a change to the contract, the

Contractor shall immediately notify the Design Professional and Owner and request instructions. By forwarding the approved Submittals to the Design Professional, the Contractor represents that the Contractor has determined and verified materials, field measurements, and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such Submittals with the requirements of the Work and of the Contract Documents. The Design Professional's approval of Submittals shall not relieve the Contractor from the responsibility for errors of any sort in Submittals or schedules. The Contractor shall perform no portion of the Work for which the Contract Documents require Submittals until the Design Professional has approved the respective Submittal. The Contractor shall maintain at the Site one copy of all approved Submittals.

2.2.3.3 Cost of Additional Review. The Design Professional shall be responsible for an initial and one subsequent review of the Submittal. Where the subsequent Submittal is not accepted due to noncompliance with the Contract Documents, the Contractor shall be responsible for payment for the additional time required by the Design Professional to complete the Submittal review.

2.2.4 Manufacturer's Recommendations. All work or materials shall be installed in accordance with the manufacturer's recommendations and requirements. The Contractor shall obtain the manufacturer's recommendations and requirements, for its use at the Site preparing submittals and executing the Work, copies of bulletins, circulars, catalogues, or other publications bearing the manufacturer's titles, numbers, editions, dates, etc. If the manufacturer's recommendations and requirements are not available, the Contractor shall request installation instructions from the Design Professional.

2.2.5 Site Plan, Land Disturbance Permits.

2.2.5.1 General. The Design Professional is responsible for providing the initial sealed Site Plan as a part of the Bidding Documents. During the Pre-Commencement phase, the Contractor shall review the initial Site Plan and make and submit recommendations for any changes to the initial Site Plan. The Contractor is required to obtain the land disturbance permit(s) applicable to the Owner that implement the National Pollution Discharge Elimination System (NPDES) requirements for stormwater management for construction activities from the appropriate issuing authority. Compliance requires that there be properly designed Best Management Practices (BMPs), properly installed BMPs, and inspection and maintenance of the installed BMPs.

2.2.5.2 Implementation. The Design Professional will depict upon the Site Plan its initial recommendations as to elements of the erosion, sedimentation, and pollution control plan, specifying his recommended design of BMPs for the Project, including stormwater management facilities, and other like matters. It is the Contractor's responsibility to review the design of the BMPs and submit any changes to the plan, including the Contractor's desired use of entrances to the Site, Contractor's trailer(s) location, laydown areas and other similar matters affecting the design and implementation of the BMPs. The Design Professional and Contractor shall arrive at a final sealed Site Plan for submission to the permitting officials that enables the land disturbance permitting of the Project. The Design Professional and Contractor shall resolve with the local permitting official any deficiencies by the end of the Pre-commencement period.

2.2.5.3 Installation, Inspection, and Maintenance. The Contractor is responsible for installation and maintenance of the BMPs as a part of its Bid. The Design Professional shall obtain the services of a qualified testing laboratory to inspect the BMPs in accordance with the permits, the costs of such inspections to be borne by the Owner. In the event of Abnormal Weather Conditions or *force majeure*, the Contractor shall be compensated for re-installation of BMPs at established Unit Prices.

2.2.6 Geological and Archeological Specimens. If, during the execution of the Work, the Contractor, any Subcontractor, or any servant, employee, or agent of either should uncover any valuable material or materials, such as, but not limited to, treasure trove, geological specimens, archival material, archeological specimens, or ore, the Contractor acknowledges that title to the foregoing is vested in the Owner. The Contractor shall notify the Owner upon the discovery of any of the foregoing, shall take reasonable steps to safeguard it, and seek further instruction from the Design Professional. Any additional cost incurred by the Contractor shall be addressed under the provision for changed conditions. The Contractor agrees that the Geological and Water Resources Division and the Historic Preservation Division of the Georgia Department of Natural Resources may inspect the Work at reasonable times.

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SECTION 3 – CONSTRUCTION PHASE

PART 1 – CONSTRUCTION PHASE SERVICES

3.1.1 Basic Construction Services.

3.1.1.1 Requirement to Commence Work. The Contractor shall under all circumstances commence work under this Contract no later than ten days after the Proceed Order Date contained in the Proceed Order.

3.1.1.2 Payment for Services and Work. Unless otherwise set forth in the Supplementary General Conditions, the Contractor shall provide and pay for all materials, supplies, labor, services, water, tools, equipment, light, power, transportation, and other utilities and facilities necessary for the proper execution and completion of the Work.

3.1.1.3 Quality of Materials and Workmanship. Unless otherwise specified, all materials shall be new, and both workmanship and materials shall be of good quality. The Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials and work. The burden of proof is on the Contractor.

3.1.1.4 Quality and Discipline of Employees. The Contractor shall at all times enforce strict discipline and good order among his employees and shall not employ on the work any unfit person or anyone not skilled in the work assigned to him.

3.1.1.5 Failure of the Contractor to Supply Workmen. A Notice of Non-compliant work may be issued for failure of the Contractor to supply enough workers or enough materials or proper materials.

3.1.1.6 Superintendence and Supervision by Contractor.

(a) Supervision by Contractor. The Contractor shall give efficient supervision to the work, using his best skill and attention. He shall carefully study and compare all drawings, specifications, and instructions and shall at once report to the Design Professional any error, inconsistency, or omission that he may discover, but he shall not be held responsible for their existence or discovery.

(b) Superintendent of Contractor. The Contractor shall keep on this work during its progress and until the Final Certificate has been executed by the Design Professional a competent Project Superintendent and any necessary assistants, all satisfactory to the Design Professional and Owner. The Project Superintendent shall not be changed except with the consent of the Owner and the Design Professional unless the superintendent proves to be unsatisfactory to the Contractor and ceases to be in his employ. The superintendent represents the Contractor and all directions given to the superintendent shall be as binding as if given to the Contractor.

(c) Replacement Project Superintendent. If the Contractor terminates the Project Superintendent or, if the Contractor, for any reason, engages a Project Superintendent different from the one originally assigned to the Project, Contractor must ensure that the replacement Project Superintendent has similar qualifications and experience as the originally identified Project Superintendent. Furthermore, the Contractor must obtain the Owner's prior written approval before engaging a permanent replacement.

3.1.2 Measurements and Dimensions. Before ordering material or doing work that is dependent upon coordination with building conditions, the Contractor shall verify all dimensions, elevations, grades, and pitch by taking measurements at the building and shall be responsible for the correctness of same. Any discrepancies between the drawings and/or specifications and the existing conditions shall be referred to the Design Professional for additional instructions before any work affected thereby is begun.

3.1.3 Rain Water, Surface Water, and Back-up. The Contractor shall protect all Work, including but not limited to, excavations and trenches, from rainwater, surface water, and back up of drains and sewers. The Contractor shall furnish all labor, pumps, shoring, enclosures, and equipment necessary to protect and to keep the Work free of water.

3.1.4 Dust Control. Dust-proof enclosures or partitions for protection wherever dusty or dirty work is performed and dampening of debris to avoid dusting when removed shall be provided and included as a cost of the work.

3.1.5 Cutting, Patching, and Fitting. The Contractor shall do all cutting, patching, and fitting of the Work that may be required to make its several parts come together properly and fit.

3.1.6 Space Conditions. All pipes passing through floors, walls, and ceilings shall be installed with sufficient space between them to permit installation of pipe insulation and floor, wall, and ceiling plates without cutting of insulation or plates. Roughed-in dimensions shall be prepared by the Contractor to accomplish this requirement. The Contractor shall locate all equipment that must be serviced, operated, or maintained in fully accessible positions. This provision includes but is not limited to valves, traps, cleanouts, motors, controllers, switchgear, drain points, filter, access doors, and fire dampers. If spaces, dimensions, or other design conditions do not permit compliance with the present article, the Contractor shall file a request in writing with the Design Professional for additional instructions, furnishing a copy to the Owner.

3.1.7 Cleaning Up.

3.1.7.1 During Construction. At all times, the Contractor shall keep the premises free from accumulations of waste material or rubbish caused by his employees, Trade Contractors, or work. Periodically during the course of the Work he shall remove all his rubbish from and about the building and all his tools, scaffolding, and surplus materials and shall leave his work "broom-clean" or its equivalent, unless more exactly specified. Prior to Final Completion by a Trade Contractor of any Trade Contract, Contractor shall require the Trade Contractor to remove from the Work and Site all temporary systems, tools, equipment, machinery, and surplus materials not required for the continued performance of any Work under the Trade Contract or this Contract. In case of dispute, after 48 hours written notice the Owner may remove the rubbish and charge the cost to the Contractor.

3.1.7.2 Prior to Material Completion. Prior to the inspection for Material Completion of the Project Contractor shall remove from the Site all wastes and rubbish, clean all tile and glass surfaces, replace broken glass, remove stains, paint spots, and clean and polish all plumbing fixtures and equipment, leave the Work "*vacuum clean"* or its substantial equivalent, all hard surface floors swept and mopped, all carpeted floors vacuumed, all surfaces other than floors dusted, blower dusted, or wiped (depending on type of surface) and surface blemishes cleaned, all glazing washed [both sides], and all electrical and mechanical equipment and fixtures cleaned, with all ductwork cleaned and filters replaced, if such are dirty, before other cleaning is started, and re-cleaned if any dust or dirt has gotten into the ductwork during the cleaning process. The Contractor shall restore existing facilities such as roads, other paved surfaces, fencing, curbing and the like at the Site to at least their preconstruction conditions; provided, however, the Contractor may, in an orderly fashion, leave such equipment and supplies at the Site as necessary to achieve Final Completion of the Project. This cleaning must be completed before the Contractor can expect the Design Professional to commence the inspection for Material Completion. To achieve Material Completion, the Contractor shall have fully cleaned the Site – all debris must have been removed from the site and all paved surfaces must have been broom swept and thoroughly hosed down.

3.1.8 Duty of Contractor to Report Defects. If any part of the Contractor's work depends for proper execution or results upon the work of any Separate Contractor to the Owner, the Contractor shall inspect and promptly report to the Design Professional any apparent defects in such work that render it unsuitable for such proper execution and results.

3.1.9 Duty of Contractor to Report Conflicts. To ensure the proper execution of his subsequent work, the Contractor shall measure work already in place and shall at once report to the Design Professional any discrepancy between the executed Work and the drawings or specifications.

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PART 2 – CHANGES TO THE WORK

3.2.1 Acknowledgement of Existing Physical Conditions. Contractor acknowledges that he has visited the premises and has taken into consideration all open and apparent conditions that might affect his work. No claim based on lack of knowledge of existing conditions shall be allowed unless the existing physical conditions cannot be discovered by a reasonably observant person. Any claims relating to conditions that are materially different from the Contract Documents and that such conditions were not open and apparent may be adjusted as provided in this Part.

3.2.2 Owner's Right to Make Changes. Without invalidating the Contract, the Owner, by Change Order and without notice to the sureties, may authorize or extra work or changes by altering, adding to, or deducting from the Work or the Contract Time, the Contract Sum being accordingly adjusted. All Change Orders shall be performed under the conditions of the original Contract except that claims for extension of time caused thereby shall be adjusted in the Change Order. The Owner's right to make, in its sole discretion, changes that are useful or desirable to the Project, is not limited.

3.2.3 Changes Forbidden without Consent of Owner. Neither the Design Professional nor the Contractor shall make any change whatsoever in the work without an approved Change Order. In the absence of an approved Change Order, the Contractor shall have no claim for payment, repayment, reimbursement, remittance, remuneration, compensation, profit, cost, overhead, expense, loss, expenditure, allowance, charge, demand, hire, wages, salary, tax, cash, assessment, price, money, bill, statement, dues, recovery, restitution, benefit, recoupment, exaction, injury, damages, or time based upon or resulting from any change. This Article do not apply to emergencies (Article 1.4.4).

3.2.4 Form and Execution of Change Orders.

3.2.4.1 The Change Order. The Change Order is the instrument by which adjustments in the Contract Sum and the Contract Time are effected. The Change Order shall be accompanied by a breakdown as set forth in Paragraph 3.2.7.4. The breakdown is for the purpose of enabling the Design Professional and the Owner to make a judgment on the dollar amount of the adjustment in the Contract Sum and is not a part of the Change Order. No condition, term, qualification, limitation, exception, exemption, modification, or proviso, except as set forth in this Part, shall appear in the breakdown. The Design Professional shall review and recommend to the Owner the dollar amount and description of the adjustments permitted by the Change Order.

3.2.4.2 Execution of Change Orders. Change Orders shall be signed by the Contractor, recommended for approval by the Design Professional, and approved by the Owner in accordance with the form of Change Order prescribed by the Owner. In the event of emergency (*see* Article 1.4.4) or significant impact to the Overall Project Schedule, the Owner shall direct the Change Order to proceed upon a Force Account until the cost and time is resolved in the manner set forth in Paragraph 3.2.7.3 below.

3.2.4.3 Disagreement between Design Professional and Contractor.

- *As to Contract Sum*. If the Design Professional and Contractor disagree on the adjustment to the Contract Sum and such disagreement is not resolved within seven days, the Owner, if it desires the Change Order work to proceed, may direct a Change Order for Force Account or Indeterminate Units.
- *As to Contract Time*. If the Design Professional and Contractor disagree on the adjustment to the Contract Time and such disagreement is not resolved within seven days, the decision of the Design Professional shall be final, subject to protest to the Owner of the decision as set forth in Section 5 Part 2.
- *As to Other Disagreements*. If the Design Professional and Contractor disagree on matters other than Contract Sum or Time, the dispute shall be resolved by the Owner as set forth in Section 5, Part 2.

3.2.4.4 Change Order Conditions. All Change Orders are issued under the following conditions and shall contain the following language as appropriate:

- *Lump Sum Change Order*: The payment and extension of time (if any) provided by this Change Order constitutes compensation in full to the Contractor and its Subcontractors and Suppliers for all costs and markups directly and indirectly attributable to the Change Order herein, for all delays related thereto and for performance of changes within the time stated.
- *Force Account or Indefinite Amount Change Order*: The payment and extension of time (if any) provided by this Change Order constitutes interim compensation to the Contractor and its Subcontractors and Suppliers for actual costs and markups directly and indirectly attributable to the Change Order herein, for all delays related thereto and for performance of changes within the time stated.
- *All Change Orders*: Any changes or reservations by the Contractor to the representations and releases in the Change Order, or refusal of the Contractor to execute the Change Order, shall be a material breach of this Contract that may be sufficient cause to issue a declaration of default.

3.2.5 All Cost and Time Impacts to be Included. Each Change Order shall include all time and monetary impacts of the change. Failure to include a change in Contract Time or in Contract Sum in Change Orders shall be considered a zero price/zero time Change Order and shall waive any change in Contract Time and Contract Sum. Commencement of Work upon a Change Order is conclusive proof that the Contractor accepts the Change Order. **.** The cost to the Owner of any change shall be determined in one or more of the following ways:

3.2.5.1 Lump Sum. The Change Order cost is determined by mutual agreement as a lump sum amount that changes the Contract Sum allowed for completion of the Work. The Change Order shall be substantiated by documentation itemizing the estimated quantities and costs of all labor, materials and equipment required as well as any mark-up used. The price change shall include the cost percent allowed for the Contractor's overhead and profit and, if eligible, Time Dependent Overhead Costs.

3.2.5.2 Unit Price Work. The Change Order cost is calculated by using unit prices and calculating the number of net units of Work in each part of the Work that is changed, either as the Work progresses or before Work on the change commences, and by then multiplying the calculated number of units by the applicable unit price set forth in the Contract or multiplying by a mutually agreed unit price if none was provided in the Contract. No additional percentage markup for overhead or profit shall be added to the unit prices as this markup is included within the unit prices. Time Dependent Overhead Costs will be added if eligible.

3.2.5.3 Force Account. The Change Order cost is accomplished by Force Account in the event the Contractor and Design Professional cannot agree on the cost of the Change Order or the cost cannot be reasonably determined prior to beginning the Work.

- A Force Account is the establishment by the Owner's Incumbrance Record of a maximum dollar amount (Stipulated Maximum Sum) beyond which no changed work may be undertaken, subject to amendment. As the Work authorized by the Change Order progresses, the Contractor must provide an accounting of actual costs incurred in accomplishing the Work and include an annotated copy of the Overall Project Schedule to show the status of the Work at the time the Change Order is issued, to show the start and finish of the changed Work, and to show the status of the Work when the changed Work is completed.
- Actual costs, except as otherwise agreed to in writing by the Owner, shall not exceed those prevailing for the trades or crafts, materials, and equipment in the locality of the Project.
- The Owner shall prescribe the dollar limit for a Force Account in writing by authorizing a Stipulated Maximum Sum of money to be committed toward execution of the change, and the Contractor shall have no authority to perform any change that will cost the Owner in excess of the Stipulated Maximum Sum.
- Within fourteen days of the conclusion of Force Account Work, the Contractor and the Owner shall arrive at the total lump sum cost for the Change Order.

3.2.5.4 Breakdown of Expenditures. The Contractor shall furnish to the Owner and the Design Professional an itemized breakdown of the quantities and prices and expenditures for labor and materials used in computing the proposed change in Contract Sum, in the form prescribed by the Owner. The Contractor shall furnish a separate breakdown for each subcontractor's charges and signed by the subcontractor on its letterhead. The breakdown shall be accompanied by the following declaration of the Contractor:

> *I do solemnly swear to the best of my knowledge, information, and belief, that the costs shown hereinabove do not exceed current costs for like services or materials in the locality of the Project and, in the case of a Force Account, the costs represented do not exceed the actual costs to the Contractor; and that the quantities shown do not exceed actual requirements.*

3.2.5.5 Overhead and Profit. The percentage for overhead and profit to be used in calculating additive changes in the Work (not including changes covered by unit prices) shall not exceed the percentages for each category listed below. Said percentages for overhead and profit shall be applied only on the net cost of the changed Work, (i.e., the difference in cost between original and revised Work).

- *Contractor*. If the Contractor does all or part of the changed Work with employees that work directly for the Contractor, its markup for overhead and profit on the changed Work shall be twenty-five percent of the first $50,000 of the net Allowable Costs, and twenty percent of the remaining net Allowable Costs, if any.
- *Subcontractor*. If a Subcontractor does all or part of the changed Work with employees that work directly for the Subcontractor, the Subcontractor's markup for overhead and profit on the Work shall be twenty-five percent of the first $50,000 of the net Allowable Costs, and twenty percent of the remaining net Allowable Costs, if any.

- *Contractor's Markup on Subcontractor's Work*. The Contractor's management markup on the subcontractor's net additional allowable expenditures shall be seven and one half percent
- *Second and Lower Tier Subcontractors.* The total management markup for all Subcontractor's work including all tiers of Subcontractors shall not exceed a total of fifteen percent for changes to the Work.

3.2.6 Changes in Contract Time. All Change Orders must state that the Contract Time and the Material Completion and Occupancy Date are either are not changed or are increased/decreased by a specific number of Days. The Contractor must provide written justification for the extension to the Design Professional and to the Owner. The written justification must demonstrate an anticipated actual increase in the critical path time required to complete the Work beyond that allowed by the Contract as adjusted by prior Change Orders beyond the Material Completion and Occupancy Date. If approved, the increase in time required to complete the Work shall be added to the Contract Time.

3.2.7 Allowable Costs for Changes in the Work. Allowable cost for changes to the Work are limited to the following:

- Labor costs for employees directly employed in the change in the Work, including salaries and wages plus the cost of payroll charges and fringe benefits.
- Materials incorporated into the change to the Work, including costs of transportation, handling and fuel.
- Equipment incorporated in the changed Work or equipment used directly in accomplishing the Work
- Costs of increases in premiums for the Contractor's Payment Bond and Performance Bond.
- Sales, consumer, use, and other applicable taxes in effect at the time the change order is approved.
- Certain costs directly attributable to the change in the Work, such as professional engineering costs.
- The Owner may require any or all of the following documentation to be provided by the Contractor to support the Allowable Costs:
    - certified payroll records showing the name, classification, date, daily hours, total hours, rate, and extension for each laborer, foreman, supervisor or other worker;
    - equipment type & model, dates, daily hours, total hours, rental rate or other specified rate, and extension for each unit of equipment;
    - invoices for materials showing quantities, prices, and extensions;
    - daily records of waste materials removed from the Site and/or fill materials imported to the Site;
    - certified measurements of over excavations, piling installed and similar work; and/or
    - transportation records for materials, including prices, loads, and extensions.

3.2.8 Costs Not Allowable for Changes in the Work. Costs not allowable under any circumstances are as follows:

- Costs due to the negligence of the Contractor, Subcontractors, or other persons for whom the Contractor is responsible.
- Home office expenses, including payroll costs for the Contractor's or any Subcontractors' officers, executives, administrators, accountants, counsel, engineers, timekeepers, estimators, clerks, and other similar administrative personnel employed by the Contractor, as these costs are deemed overhead included in the percentage markups allowable in Article 3.2.5 above.
- Home and branch office expenses that include, but are not limited to, expenses of Contractor's home and branch offices, Contractor's capital expenses, interest on Contractor's capital used for the Work, and other general overhead expenses of the home and branch office (including those referred to as "Eichlay costs").
- Where Work is deleted from the Contract (by Bulletin, Change Order, or otherwise) prior to commencement of that Work without substitution of other similar Work, one hundred percent of the Contract Sum attributable to that Work shall be deducted from the Contract Sum.
- Wages of a foreman, if the foreman is concurrently supervising other Work at the Site.
- Premiums for bonds required of Subcontractors by the Contractor.

3.2.9 Change Order Formats. Formats for Lump Sum Change Orders and for Change Orders based upon either a force account or upon unit pricing with an indeterminate number of units are listed in Section 7, Forms and are available from the Owner.

3.2.10 Changes due to Subsurface or Other Unforeseen Conditions.

3.2.12.1 Subsurface Conditions. Unless the Contract Documents stipulate specific quantities and units of rock or unsuitable soils, the Contractor shall assume material below the surface of the Earth to be earth and other material that can be removed by power shovel or similar equipment. Should conditions encountered below the surface of the ground be at variance to the number of unit requirements as indicated by drawings or specifications, and absent an agreed-upon unit price established prior to the bid by Addendum, or after contract execution by Change Order, the Contract Sum and/or time shall be adjusted as provided in the Contract Documents for changes in the work.

3.2.12.2 Other Unforeseen Conditions. If unknown physical conditions are encountered at the Site that differ materially from those indicated in the Contract Documents, then the Contractor shall give notice to the Design Professional promptly before conditions are further disturbed, but in no event later than two business days after the first observance of the conditions. The Design Professional shall promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the Contractor's cost or time required for performance of any part of the Work, the Design Professional may recommend an adjustment by Change Order to the Contract Sum or Contract Time, or both. If the Design Professional determines that the conditions at the Site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Design Professional shall so notify the Owner and the Contractor in writing, stating the reasons. Protest by either party of the Design Professional's decision are covered in Section 5, Part 2.

3.2.11 Compensable Rock. CAUTION: No rock for which extra compensation is expected to be received shall be removed except pursuant to and in conformity with a written authorization or order of the Owner. Unless otherwise provided in the Bid Documents, no removal of rock as defined herein shall be included in the Bid. Shale, rottenstone, or stratified rock that can be loosened with a pick or removed by a hydraulic excavator equivalent to a Caterpillar Model 215, a single engine pan (Caterpillar 621 or equivalent) that is pushed by a crawler tractor (Caterpillar D-8K or equivalent), or similar equipment shall not be classified as compensable rock.

3.2.11.1 Definitions of Compensable Rock. Rock, for the purposes of pricing its removal, is defined as follows:

(a) Rippable Rock. Rippable rock is defined as any material that can be ripped with a single-tooth hydraulic ripper drawn by a crawler tractor having a minimum draw bar pull rated at 56,000 pounds (Caterpillar D-8K or equivalent) and occupies an original volume of at least one cubic yard.

(b) Mass Rock. Mass rock is defined as any material that cannot be ripped with a single-tooth hydraulic ripper drawn by a crawler tractor having a minimum draw bar pull rated at 56,000 pounds (Caterpillar D-8K or equivalent) and occupies an original volume of at least one cubic yard.

(c) Trench Rock. Trench rock is defined as any material that must be removed from a trench that cannot be excavated with a hydraulic excavator having a bucket curling force rated at 18,300 pounds (Caterpillar Model 215 or equivalent) and occupies an original volume of at least one-half cubic yard.

(d) Caisson Rock. Caisson Rock is defined as material that must be removed from a shaft which cannot be penetrated faster than two feet per hour (fifteen minute minimum) using a rock auger with bullet-shaped hardened steel teeth (Kennametal bits or equivalent), and the drilling equipment should have the capacity to produce a continuous torque of at least 1,000,000 inch pounds and a downward force of at least 50,000 pounds (a Hughes LLDH in good working condition) for piers up to seventy two inches in diameter. The compensation for Caisson Rock should include only material that cannot be penetrated by the rock auger at the specified rate.

3.2.11.2 Pricing for Compensable Rock. All compensable rock shall be priced by unit prices upon volume prior to removal and shall be calculated by survey and engineering calculations. No rock shall be priced by truckload, bucket load, or other similar pricing methods. Unit prices shall be determined prior to removal, either in the Contract Documents or by Change Order. Unit prices shall be inclusive of all profit and overhead, except for Time Dependent Overhead Costs. Unit prices shall include the following:

(a) Excavation and removal of all rubble;

(b) Addition and removal of overburden for blasting;

(c) Excavation of all blast rubble;

(d) Replacement of suitable soils in areas of overblasting or over removal; and

(e) All costs of labor, equipment, supplies, blasting materials, safety requirements, drayage, haulage, and disposal, including offsite disposal costs.

3.2.12 Subcontractor Claims for Extended General Conditions Costs. The daily rate for Time Dependent Overhead Costs established in the Contract is intended to compensate the Contractor for the additional jobsite overhead costs resulting from any

compensable time extension. The Contractor, in its sole discretion, shall be responsible for allocating the Time Dependent Overhead Costs among its affected subcontractors and itself. Owner's payment of the Time Dependent Overhead Costs to the Contractor, and Contractor's allocation thereof, shall constitute the only monetary compensation the Contractor and subcontractors shall be entitled to receive as reimbursement for Time Dependent Overhead Costs incurred as a result of any compensable delay to the Project.

3.2.13 Release of Claims. The execution by the Contractor of a Change Order shall be and operate as a release to the Owner of all claims by the Contractor and of all liability owing to the Contractor for all things done or furnished in connection with the Work described in the Change Order. The execution of any Change Order by the Owner shall not be an acceptance of any Work or materials not in accordance with the Contract Documents, nor shall it relieve the Contractor of responsibility for faulty materials or workmanship or operate to release the Contractor or his surety from any obligation arising under the Contract or the Performance Bond or Payment Bond.

3.2.14 Sole Source Designation for Change Order Work.

3.2.16.1 Definition of Sole Source. As used in this Article 3.2.16, "Sole Source" means a Trade Contractor or Supplier or Subcontractor specified by name in a Bulletin as the exclusive source from which conforming goods or services may be obtained. Designation of goods or services by reference to a named source accompanied by the qualification "or equal" or similar language is not a designation of a Sole Source as that term is defined herein.

3.2.16.2 Limitations. This Article 3.2.16 applies only to Bulletins referenced in a proposed Change Order that designates a Sole Source that was not designated in the Bidding Documents. Except as stated in this Article, the Contractor's inability to obtain payment and performance bonds from Sole Source Subcontractors or warranties from Subcontractors, as required under the Bidding Documents for this Contract, shall not otherwise excuse the Contractor from its bonding and warranty obligations under this Contract.

3.2.16.3 Sole Source as Grounds for Rejection of a Change Order. If a Change Order is submitted to Contractor for the purposes of adding a Bulletin to this Contract and said Bulletin designates a Sole Source from which Contractor is required to procure goods or services necessary to perform the Work, which Sole Source has not been designated previously, Contractor shall be entitled to reject the proposed Change Order if the designated Sole Source refuses to provide to Contractor the warranties, bonds, terms or schedule required under the Contract Documents, including any warranty or terms or schedule required by Bulletins referenced in the proposed Change Order. In such event, Contractor shall give written notice to the Owner rejecting the proposed Change Order and, if possible, shall accompany said written notice with a proposal from Contractor for changes or modifications to the Bulletin so as to eliminate the Sole Source designation but to achieve goods or services equal in quality or function. The Owner may then require the Design Professional to revise the subject Bulletin so as to eliminate the designation of the Sole Source by incorporation of Contractor's proposal or otherwise. Upon revision of the Bulletin by the Design Professional and approval thereof by the Owner, the Owner shall again submit to the Contractor a proposed Change Order for the purpose of adding the revised Bulletin to this Contract. If the Owner decides to retain the Sole Source in the Change Order and Contractor cannot acquire the full contractually required warranties from the Sole Source, Contractor shall be held only to the warranty terms and schedule obtainable from the Sole Source.

3.2.16.4 No Excuse Without Notice. If Contractor accepts a proposed Change Order adding a Bulletin to this Contract that designates a Sole Source without invoking this Article and putting the Owner on notice, Contractor shall not be excused from its obligations with respect to the described Work by reason of the refusal of a designated Sole Source to provide warranties as required under this Contract.

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PART 3 – TIME

3.3.1 Time is of the Essence. Time is of the essence of this Contract and all obligations hereunder.

3.3.2 Competent Management of Time. The Contractor has represented to the Owner, in order to be awarded this contract, that the Contractor is experienced in managing construction in accordance with contract requirements and in a timely manner and that the Contractor has included in his proposal sufficient sums to carefully and competently manage this project for completion within the stipulated Contract Time.

3.3.3 Contract Time.

3.3.3.1 Fair and Reasonable. The Contractor has carefully examined and analyzed the Site, the Contract Documents, and all known factors related to his ability to complete this project within the Contract Time stipulated. By submitting his bid for this project, Contractor accepts the Contract Time as fair and reasonable.

3.3.3.2 Delays. The parties recognize there may be delays to perform Change Order work in the event that conditions encountered at the Site are different from those indicated in the Contract Documents, or to perform Change Order work to correct errors in the plans and specifications. Execution of any change must be authorized. In such event, there shall be an adjustment in the Contract Sum as provided in the Contract Documents for changes in the Work, The parties agree that such delays are not a ground for claiming extraordinary remunerations except as set forth in this Contract in Article 3.3.8 below.

3.3.4 Commencement, Prosecution, and Completion.

3.3.4.1 Commencement, Prosecution, and Completion of Work. The Contractor will be required (a) to begin actual physical work on the Site as directed in the Proceed Order; (b) to prosecute the Work with faithfulness and energy (c) to install the various parts of the work at the same rate (or better) as shown on the Overall Project Schedule and (d) to complete the Work within the Contract Time, as adjusted. Material Completion of the Project must be achieved on or before the Material Completion and Occupancy Date under the Schedule, as adjusted.

3.3.4.2 Contractor's Acceleration for failure to meet Schedule Requirements. If the Contractor falls materially behind the Milestone dates established in the Overall Project Schedule, Contractor shall, within seven days after demand of the Owner, cause its employees and Subcontractors to perform work at an accelerated pace in addition to the normal working hours and working days to return the Work to schedule. Contractor shall be entitled to no claim against the Owner for any cost, expense or damages incurred for such acceleration.

3.3.5 Construction Progress Schedule (Overall Project Schedule).

3.3.5.1 Submission. Within sixty days after the Effective Date Contractor must submit a Construction Progress Schedule in accordance with Section 2.1.5.

3.3.5.2 Approval of Overall Project Schedule. . Upon recommendation by the Design Professional and approval by the Owner, the Construction Progress Schedule shall become the Overall Project Schedule, and shall govern the schedule of activities of the Contractor under this Contract

3.3.5.3 Monthly Updates. The Contractor must provide the Design Professional and the Owner with monthly updates showing completed activities and any changes to sequencing or activity durations

3.3.6 Completion Date. The Work under this Contract shall be completed by midnight of the date required in the Contract as the Material Completion and Occupancy Date unless extended by approved requests for extension of time.

3.3.7 General Rule – No Damages for Delay, Extension of Time Sole Remedy. Contractor shall not be entitled to any damages for delay or to any other reimbursement as a Cost of the Work, or to an increase in the contract amount, or to payment, damages, monies, or compensation of any kind from Owner for direct, indirect, impact, or disruption damages (including but not limited to costs of acceleration of Work or any Phase thereof) arising because of delay or other hindrance of any kind whatsoever; except as specifically permitted by Article 3.3.8. Extension of the time is the Contractor's sole remedy for any delays not the fault of the Contractor.

3.3.8 Exception to General Rule – Compensable Delay. The extension of the Contract Time and any adjustment to the Contract Sum for Time Dependent Overhead Costs shall be as set forth in this Article 3.3.8 shall be Contractor's sole and exclusive remedy for delays, hindrances, interferences or resulting inefficiencies and re-sequencing, providing the critical path is extended due to no fault of or material contribution to the delay by the Contractor. All Extensions of Time and compensation for Time Dependent Overhead Costs (see Articles 3.3.11 and .12) are to be processed as a part of a Change Order pursuant to Article 3.2.6.

3.3.8.1 Compensable Delay – Unavoidable Delay.

- *Delay by Owner or Design Professional*. If the Contractor is delayed in the progress of the Work between the Proceed Order Date and the Material Completion and Occupancy Date, as amended, by an act or neglect of the Owner, Owner's employees, Design Professional or Separate Contractors employed by the Owner, or by other causes beyond the Contractor's control which the Design Professional determines are the fault of the Owner or the Design.

- *Delay in Responses to Submittals*. Any claim by Contractor for a change in the Material Completion and Occupancy Date due to delay of responses to submittals made in accordance with the submittal schedule. Any claim for extension of time take into consideration the nature of the submittal.

3.3.8.2 Compensable Delay – Certain Change Orders.

- *Owner-Requested Changes*. If the Owner requests changes in the Contract Documents that materially affect the completion of the Work by lengthening the critical path of the Overall Project Schedule.

- *Other Change Orders*. For Change Orders involving the following situations that would materially affect the completion of the Work by lengthening the critical path of the Construction Progress Schedule.

    - Changes due to Subsurface or Other Unforeseen Conditions.
    - Changes for Compensable Rock

3.3.8.3 Compensable Delay – *Force Majeure*. If, between the Proceed Order Date and the Material Completion and Occupancy Date, as amended, the CM/GC is unable to perform or is delayed in the performance of any of the terms and provisions of this Contract, that materially affects the completion of the Work by lengthening the critical path of the Construction Progress Schedule, as a result of (i) governmental preemption of materials in connection with a national emergency declared by the President of the United States; (ii) riot, insurrection, acts of terror or terrorism or other civil disorder affecting performance of the Work; (iii) labor strikes that could not be reasonably anticipated, or (iv) earthquakes, or unusual and extreme weather conditions constituting Acts of God, then, and in any such event, such inability or delay shall be excused, and the time for completing the affected portions of the Project (and the entire Project, if applicable) shall be extended for such reasonable period of time as the delay has affected the critical path of the performance of the Work hereunder; *provided, however,* that Contractor shall: (i) take all reasonable actions to mitigate damages and minimize the delay; and (ii) notify Owner in writing not later than seven days after the event; otherwise Contractor will be deemed to have waived the excuse or delay.

3.3.8.4 Compensable Delay – Abnormal Weather. Extensions of time will be granted for abnormal inclement weather conditions that delay the critical path of the progress of the work. Abnormal weather delay is defined as days lost to weather conditions either (i) in excess of days specified in the Supplementary Conditions, or (ii) as days in excess of a local historic average prevailing at the Site recorded by the National Oceanic and Atmospheric Administration (NOAA) for the 120 months immediately preceding the Proceed Order Date.

3.3.9 Non-Compensable Delay. Contractor understands, acknowledges and agrees that delays occasioned by the events and occurrences set forth below are not compensable delays and do not constitute reason for extending the Date for Material Completion and Occupancy. It is Contractor's responsibility to make adequate provision for the following in scheduling the Work:

- *Normal Weather Conditions.* Weather conditions other Abnormal Weather specified in paragraph 3.3.8.4.
- *Delay in Delivery of Materials or Equipment*. Delay in delivery of materials or equipment for any cause other than those specified in Paragraph 3.3.8.3 or 3.3.8.4.
- *All Other Delay*. All delay not covered in Article 3.3.8.

3.3.10 Submission of Claims for Compensable Delay or to Extend the Material Completion and Occupancy Date.

3.3.10.1 Time for Submission. Any claim by Contractor for a change in the Contract Time or the Material Completion and Occupancy Date shall be made within fourteen days of the day on which the Contractor becomes aware of the event on which the claim is based.

3.3.10.2 Delay Claim Must Be In Writing. Any claim to extend the Contract Time and Material Completion and Occupancy Date must be in writing, must set forth in detail the basis for the claim and the number of days of delay claimed, must be correlated with the approved Overall Project Schedule, must be executed by the Contractor and delivered to the Design Professional and the Owner, and must be reviewed and an appropriate time assessed by the Design Professional.

3.3.10.3 When Delay Claim Deemed Waived. Any claim to extend the Contract Time and Material Completion and Occupancy Date not made in writing to Owner within the above time periods shall be deemed waived and shall not thereafter be valid. In the case of a continuing delay as a result of a single event, only one claim submission is necessary.

3.3.10.4 Design Professional to Decide. The Contract Time and the Material Completion and Occupancy Date may be extended for such reasonable time as the Design Professional may decide, and the Overall Project Schedule shall then be updated. The Design Professional's decision as to abnormal weather delay shall be subject to protest by either the Contractor or the Owner as set forth in Section 5, Part 2.

3.3.11 Payment for Extensions of Contract Time. The Contractor expressly agrees that the Contractor's sole monetary remedy for Compensable Delay shall be calculated at the daily rate established for the Time Dependent Overhead Costs. If any extension of time is deemed eligible for Time Dependent Overhead costs, the amount calculated by multiplying the daily rate for Time Dependent Overhead Costs times the number of days approved shall additionally be added to the maximum amount for Overhead Costs and Expenses. In situations where Time Dependent Overhead Costs are authorized, and the cost incurred exceeds 170% of the established Time Dependent Overhead Cost daily rate, then the Contractor may submit a claim under this article for consideration of such extraordinary additional cost.

3.3.12 Time Dependent Overhead Costs. The purpose of the Daily Rate for Time Dependent Overhead Costs is to provide an efficient factor for determining additional compensation to the constructor for what are commonly referred to as "general conditions costs" for use in change orders that increase the contract time. The Daily Rate for Time Dependent Overhead Costs is established at one of three times:

- At the Pre-Bid Conference and added to the Supplementary Conditions by Addendum
- By negotiation with the Contractor as a unit price during the Construction Preparation Period and added to the Supplementary Conditions (*see e.g.* Article 2.1.8).
- By negotiation at the time of a change order that includes compensable delay.

Computation of the daily rate is achieved by using the following.

- Actual or broken out costs utilized in similarly sized projects, which utilize the same or similar construction means and methods
- Rent for anticipated major pieces of construction equipment, such as construction cranes.
- Unusual construction challenges, such as dewatering during the site preparation phase, or anticipated weather conditions during the anticipated construction schedule (e.g. concrete pours during anticipated freezing conditions).

From the aggregated costs set forth above, *EXCLUDE* the following.

- Cost of work, including labor.
- Fixed costs that are not dependent upon time, such as costs for safety equipment or other equipment owned and not rented, and the like.
- Fixed costs for permits, testing and inspections, and the like.

3.3.12 Recovery of Schedule Delays. If the Design Professional determines that the Project is one week or more behind the Overall Project Schedule, the Design Professional shall notify the Contractor in writing to deliver, within seven days, the Contractor a written plan explaining how the Contractor intends to bring the Project back on schedule. The Contractor's plan must provide sufficient detail to allow the Design Professional and Owner to determine the proposal's feasibility.

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PART 4 – CORRECTING THE WORK, INSPECTIONS, COVERING AND UNCOVERING WORK

3.4.1 Correcting the Work.

3.4.1.1 Notice of Non-compliant Work. A Notice of Non-compliant Work shall be in writing, shall be dated, shall be signed by the Design Professional, shall be addressed to the Contractor with a copy to the Owner, and shall contain three elements as follows:

(a) Description:

- Work that has been omitted or
- Work that is unexecuted as of the date of the Notice of Non-compliant Work, the time for its incorporation into the work as planned in the Overall Project Schedule having expired, or
- Work that has not been executed in accordance with the methods and materials designated in the Contract Documents.

(b) References: Citation of the provision or provisions of the Contract Documents which specify the Work.

(c) Time for Compliance. Fixing of a reasonable space of time within which the Contractor shall have made good the deficiency (which said space of time shall not be deemed to be an extension of Contract Time) for filing the Notice of Readiness for Inspection for Material Completion nor shall it be deemed to be authorization for amendment to the Overall Project Schedule.

3.4.1.2 Failure to Supply Workmen or Materials or to Prosecute the Work. A Notice of Non-compliant Work may be issued for failure of the Contractor to supply enough workers or enough materials or proper materials to prosecute the Work. A Notice of Non-compliant Work in such event may be based on Article 3.3.2 (Competent Management of Time) or upon the quality of materials or workmanship (Paragraph 3.1.1.3}.

3.4.1.3 Removal and Making Good of Non-compliant work. The Contractor shall remove from the Site within the space of time designated in Notice of Non-compliant Work all Work determined by the Design Professional as failing to conform to the contract, whether incorporated in the work or not, and the Contractor shall promptly replace and re-execute the work in accordance with the Contract and without expense to the Owner and shall bear the expense of making good all work of other contractors destroyed by such removal or replacement. The Contractor shall supply any omitted work and perform all unexecuted work within the space of time fixed by the Design Professional in Notices of Non-compliant Work.

3.4.1.4 Remedies of the Owner for Breach of Notice of Non-compliant Work.

3.4.1.4.1 Failure to Make Good a Deficiency. If the Contractor does not make good a deficiency within a reasonable space of time fixed in a Notice of Non-compliant Work the Owner may do any one or more of the following and deduct the cost thereof from any payment then or thereafter due the Contractor:

- Remove the Non-compliant Work and store it at the expense of the Contractor.
- Supply omitted work, perform unexecuted Work, or replace and re-execute Work not done in accordance with the methods and materials designated in the Contract Documents

3.4.1.4.2 Other Remedies. The remedies stated in this article are in addition to the remedies otherwise available to the Owner, do not exclude such other remedies, and are without prejudice to any other remedies.

3.4.1.5 Notice of Correction from Contractor. The Contractor shall give prompt notice in writing to the Design Professional, with copy to the Owner, upon completion of the correction of the Non-Compliant Work

3.4.1.6 The Owner's Right to Correct Work. If the Contractor should neglect to prosecute the Work properly or fail to correct Non-compliant work or fail to perform any provision of this Contract, the Owner, after three days' written notice to the Contractor, may without prejudice to any other remedy he may have (including without limitation, termination of the contract and remedies against the Contractor's surety), make good the deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor.

3.4.2 Inspections.

3.4.2.1 Access to Work. The Design Professional, the Owner, and their representatives shall have access at all times to the work wherever it is in preparation or progress, and the Contractor shall provide proper facilities for such access and for inspection.

3.4.2.2 Notice of Readiness for Inspection to Design Professional from Contractor Prior to Covering Work. If the specifications, the Design Professional's instructions (either in the specifications or issued later in writing), laws, ordinances or any public authority require any work to be specially tested or approved, the Contractor shall give the Design Professional timely notice in writing of its readiness for inspection. If the inspection is by any authority other than the Design Professional, the Contractor shall give timely notice of the date fixed for such inspection. Inspections by the Design Professional shall be made promptly and, where practicable, at the source of supply.

3.4.2.3 Fire Marshal Inspections.

(a) General. The State Fire Marshal may make inspections at any time. It shall be the responsibility of the Contractor to request an inspection by the fire marshal at eighty percent completion and at 100% completion and to give notice when all items on the 100% inspection report have been completed. Requests shall be in writing with a copy to the Owner and Design Professional.

(b) Inspections Defined. The basic definitions for eighty percent and 100% inspections are as follows:

- *Eighty Percent Inspection*: The structural components are in place and open for review of the fire safety components. Structural components include the following: fire walls, vertical shafts, stairways, smoke stops, hazardous area separation, roof and ceiling assemblies, corridor and door width, and HVAC system.
- *100% Inspection*: The Contractor has completed all of the items on the eighty percent inspection report and has the certificate of occupancy in hand.

3.4.2.4 False Start. In the event the Contractor shall have issued notice of readiness prematurely, his action shall be deemed to be a "false start." The Contractor shall be liable for the damage resulting from the aforesaid false start, including, but not limited to, the salary, professional fees, and travel and living expenses of the person or parties inconvenienced by the aforesaid false start.

3.4.2.5 Certificate of Occupancy. The Contractor's obligation under the Contract is to install the Work in accordance with the Contract Documents, obtain the Certificate of Occupancy from the State Fire Marshal or his deputy, and forward it to the Design Professional as a part of the final close out procedures. The Design Professional's obligation is to design the Work to comply with the applicable codes and to qualify for a Certificate of Occupancy.

3.4.3 Uncovering Work.

3.4.3.1 Re-examination or Re-testing of Work Covered with Consent of Design Professional. Re-examination or re-testing of questioned Work previously covered with consent of the Design Professional may be ordered by the Design Professional and must be uncovered by the Contractor. The Contractor shall pay the costs of re-examination and replacement or re-testing if such Work is found not in compliance with the Contract Documents, otherwise the Owner shall pay such costs.

3.4.3.2 Re-examination or Re-testing of Work Covered Without Consent of Design Professional. If any Work should be covered without approval or consent of the Design Professional or contrary to any provision of the Contract Documents, such Work must be uncovered for examination by the Design Professional at the Contractor's expense. The Contractor shall be liable for the costs resulting from the aforesaid uncovering, including, but not limited to, the salary, professional fees, and travel and living expenses of the person or parties inconvenienced thereby.

3.4.4 Inspection Does Not Relieve Contractor. Under the Contract Documents, the Contractor acknowledges that it has the responsibility for furnishing all services, labor, supplies, and materials for the entire Work in accordance with such documents. No provisions of this article nor any inspection of the Work by the Owner, representatives of the Owner, the Using Agency, Contract Compliance Specialist, clerk-of-the-works, engineers employed by the Design Professional, representatives of the Design Professional, or the Design Professional shall in any way diminish, relieve, or alter said responsibility and undertaking of the Contractor. Neither shall the omission of any of the foregoing to discover or to bring to the attention of the Contractor the existence of any Work or materials injured or done not in accordance with said Contract Documents in any way diminish, relieve, or alter such obligation of the Contractor nor shall the aforesaid omission diminish or alter the rights or remedies of the Owner as set forth in the Contract Documents. The Contract Compliance Specialist has no power to make decisions, to accept or reject work, or to consent to the covering of Work. The Contract Compliance Specialist owes no duty to the Contractor.

PART 5 – SUBCONTRACTORS, TRADE CONTRACTORS, AND SUPPLIERS,

3.5.1 Subcontractors, Trade Contractors, and Suppliers.

3.5.1.1 Submission of List. Within fourteen days of the Effective Date of the Contract, the Contractor shall submit in writing to the Design Professional a list of the names of Subcontractors that the Contractor intends to employ on the Work. Neither the Owner nor the Design Professional undertakes to pass upon or approve any Subcontractor, Trade Contractor, or supplier, the selection being a matter lying solely within the discretion of the Contractor. The list is not submitted for approval but is for the purpose of establishing the following:

- Which trades and what portions of the work are to be performed under subcontract.
- Names of firms selected by the Contractor to perform work by subcontract.
- The identity of each minority or female owned Subcontractor or Supplier performing work on or supplying material to the project, which must be reported each quarter by firm and amount paid.

3.5.2 Representation of Contractor. The Contractor represents that the Subcontractors, Suppliers, and Trade Contractors selected by it are reputable, skilled, reliable, competent, qualified in the trade or field in which they are to perform on the Project, and thoroughly familiar with the codes and laws applicable to their work.

3.5.3 Contractor Responsible for Acts and Omissions. The Contractor agrees that he is as fully responsible for the acts and omissions of his Subcontractors, Trade Contractors, Suppliers, and employees, and further of all persons directly or indirectly employed by them, as the Contractor is for the acts and omissions of employees and persons directly employed by the Contractor. The failure of a Subcontractor, Trade Contractor, supplier, or employee to perform shall not be asserted by the Contractor as an excuse for any omission from or noncompliance with requirements of the Contract Documents; nor shall the Contractor be entitled to an extension of time solely because of failure of a Subcontractor, Trade Contractor, supplier, or employee to perform. The subcontracting of work does not relieve the Contractor of the responsibility for the execution of the work and for compliance with all requirements of the Contract Documents. The Contractor shall not assert negligence, inefficiency, insolvency, bankruptcy, or incompetence of any Subcontractor, Trade Contractor, supplier, or employee as excuse for the existence of any noncompliance with or omission to fulfill any obligation under the Contract either as to timely performance or as to compliance with methods and materials designated in the Contract Documents; nor shall the Contractor assert nonperformance of a Subcontractor, Trade Contractor, supplier, or employee as excuse for the existence of any noncompliance with or omission to fulfill any obligation under the Contract. As to Subcontractor, Trade Contractor, supplier, and employees of the Contractor, the doctrine that a principal is liable for the acts and omissions of his agent shall be binding on the Contractor in his relationship to the Owner, and the Contractor may not reverse the aforesaid doctrine by contract or legal mechanism.

3.5.4 No Contract between Owner and Any Subcontractor, Trade Contractor, Supplier, or Employee. Nothing contained in the Contract Documents shall create any contractual relation between the Owner and any Subcontractor, Trade Contractor, Supplier, or employee of the Contractor or its Subcontractors.

3.5.5 Relationship of Contractor With Subcontractors, Trade Contractors, and Suppliers.

3.5.5.1 Obligations of Each. The Contractor agrees to bind every Subcontractor, Trade Contractor, Supplier (hereinafter collectively referred to as "Subordinate Contractor") to the terms of the Contract Documents insofar as they are applicable to its work, including the following provisions of this Article:

(a) The Contractor Agrees:

- To be bound to the Subordinate Contractor by all the obligations that the Owner owes to the Contractor under the Contract Documents.
- To pay the Subordinate Contractor upon the payment of certificates issued under the schedule of values described in the General Conditions the amount allowed to the Contractor on account of the Subordinate Contractor's work to the extent of the Subordinate Contractor's interest therein within seven days of receipt of payment from the Owner; provided, however, that retainage shall be released to the Subordinate Contractor as provided by law and in accordance with the statutory affidavit set forth in Section 7, Forms.
- To pay the Subordinate Contractor a just share of any property insurance money received by the Contractor and due to Subordinate Contractor for work performed by Subordinate and paid for by insurance.
- That no claim for services rendered or materials supplied or other matters by the Contractor against the Subordinate Contractor shall be valid unless written notice thereof is given by the Contractor to the

Subordinate Contractor prior to or during the first ten days of the calendar month following that in which the Contractor determines that the claim is chargeable against that Subordinate Contractor.

- To give the Subordinate Contractor, upon its request, an opportunity to be present with Contractor and to submit evidence in any dispute involving rights of the Subordinate Contractor.

(b) The Contractor Agrees to require its Subcontractors to do the following:

- To be bound to the Contractor by the terms of the Contract Documents and to assume toward the Contractor all the obligations and responsibilities that the Contractor by the aforesaid documents assumes toward the Owner.
- To submit to the Contractor applications for payment in such reasonable time as to enable the Contractor to apply for payment under these General Conditions.
- To make all claims for extras, for extensions of time or for damages to the Contractor in the manner provided in the General Conditions for like claims by the Contractor upon the Owner, except that the time for making such claims to the Contractor is within ten days after the initial event leading to the claim.
- To pay their Subordinate Contractors upon the payment of certificates issued under the schedule of values described in the General Conditions the amount allowed on account of such Subordinate Contractor's work to the extent of such Subordinate Contractor's interest therein within seven days of its receipt of payment; provided, however, that retainage shall be released as provided by law and in accordance with the statutory affidavit set forth in Section 7, Forms.
- To pay their Subordinate Contractors upon Subcontractor's receipt of payment such that at all times their Subordinate Contractors' aggregate payments shall be in proportion to the Work performed by each of the Subordinate Contractors.

3.5.5.2 Owner Not Obligated to Any Subcontractor, Subordinate Contractor, Trade Contractor, or Supplier. There is no obligation on the part of the Owner to pay to or to see to the payment of any sums to any Subcontractor, Subordinate Contractor, Trade Contractor, Supplier, laborer, employee, or person supplying labor, materials, machinery or equipment to the Project.

3.5.5.3 Term "Substantial Completion" Deleted. The term "substantial completion," if found, is hereby deleted and is of no force in all Subcontracts, Trade Contracts, and in the Trade Sections of the Contract Documents. In most contexts, the term is replaced by the term "Material Completion" as defined in this Contract.

3.5.5.4 Failure to Incorporate Terms in Subcontracts. The Contractor agrees that failure on his part to incorporate this Article 3.5.5 in all Subcontracts, Trade Contracts, or Supplier contracts, is a material breach of an essential covenant of this Contract, and further agrees that in the event of such breach the Contractor shall, within five days after demand of the Owner, furnish proof in writing that the deficiency has been remedied to the end that (1) the Contractor may not maintain that it is beyond his competence to require performance of terms of the contract by a subcontractor and (2) no subcontractor may maintain that he has not assumed toward the Contractor all the obligations and responsibilities that the Contractor has assumed toward the Owner. Failure on the part of the Contractor to effect remedy as above within five days after receipt of written demand of the Owner shall be grounds for issuance of a declaration of default by the Owner.

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SECTION 4 – COMPENSATION

PART 1 - GENERAL

4.1.1 Payments. The Owner will make progress payments to the Contractor in accordance with Section 4 of the General Conditions. Final Payment will be made in accordance with Section 6 of the General Conditions. The date and amount of payment are subject to Section 4, Part 2. Sums retained by the Owner (retainage) remain the property of the Owner until such time as the Contractor shall have become entitled to receive such payment pursuant to Section 6 of the General Conditions by furnishing the remainder of the Work and services required by the Contract Documents.

4.1.2 Application for Payments.

4.1.2.1 Form of Application. The Contractor shall submit monthly to the Design Professional an Application for Payment on the form set forth in Section 7 and, if requested by the Owner or Design Professional, shall attach backup materials such as receipts or other vouchers showing payments for materials, labor and Subcontractors.

4.1.2.2 Schedule of Values. Before the first Application for Payment Contractor shall submit to the Design Professional a Schedule of Values of the various parts of the work, including quantities, aggregating the total sum of the Contract, divided in the same manner set forth in the Application for Payment Form, and shall be broken down by CSI Category and, in certain situations, by CSI Description and capital asset category. The purpose is to provide appropriate backup documents for the Contractor's Final Certification of Costs Each Application for Payment shall be related to the Schedule of Values.

4.1.2.3 Materials Stored. If the Application for Payment includes materials delivered and suitably stored at the Site but not incorporated in the work, payment is conditional upon submission by the Contractor of bills of sale or such other procedure as will establish the Owner's title to the stored material. The Contractor is responsible for the existence, protection, and, if necessary, replacement of materials until execution of the Final Certificate of the Design Professional. The Owner shall not pay for any materials stored off-site.

4.1.2.4 Retainage. Retainage shall be withheld from each periodic payment to the Contractor in the amount of ten percent of the sum of the total amount earned for work–in-place (original Contract), total amount earned for work-in-place (Change Orders), and Value of Materials stored at the Site. After one-half of the Contract Sum, including Change Orders, becomes due the Contractor may request, with the Design Professional's approval, to convert the retainage be reduced to a lump sum to be held until Material Completion, so long as the Work meets all of the following conditions:

- The progress of the Work is on or ahead of the Overall Project Schedule; and
- There are no breaches of Notices of Non-compliant Work; and
- There is no delinquency in the completion of Work and filing of the final breakdown and accounting pursuant to any Change Orders utilizing a Force Account;

The Owner will withhold no further retainage from payments to the Contractor unless one or more of the following events occur, at which the retainage of ten percent of each Application for Payment will resume:

- The progress of the Work falls behind the Overall Project Schedule by as much as five percent; or
- The Contractor breaches a Notice of Non-compliant Work; or
- The Contractor becomes delinquent in regard to the filing of the final breakdown and accounting pursuant to any Change Orders utilizing a Force Account;

4.1.2.5 Subcontractor's Retainage Release**.** At the discretion of the Owner and request by Contractor, an amount equal to the subcontract retainage of a Subcontractor may be separately released from the retainage held by the Owner the Subcontractor's completion of its Work, upon approval of an application in accordance with the Owner's specimen (See Section 7, Forms) Checks releasing a Subcontractor's retainage shall be made payable to the Contractor, the Contractor's surety, and Subcontractor and mailed to the Contractor's surety, unless the surety otherwise consents.

4.1.3 Processing of Application for Payment. The Contract Compliance Specialist (CCS) will review the Application for Payment prepared and executed by the Contractor and, if he concurs, execute a certificate on the face of the Application for Payment as to its accuracy. If the CCS and Contractor agree, the Design Professional, after making such inquiry as it deems appropriate, shall recommend payment on the Application for Payment and forward it to the Owner. If the CCS and the Contractor cannot agree on the appropriateness of the Application for Payment in question, the Design Professional shall make the decision. To resolve the dispute, the Design Professional shall visit the Site and conduct such inspections and reviews as are necessary to make a decision as to the accuracy of the Application for Payment and recommend an amount to be paid.

4.1.4 Effect of Design Professional's Certificate on an Application for Payment. No certificate issued by the Design Professional, nor payment made to the Contractor by the Owner, or partial or entire use or occupancy of the Work by the Owner shall be an acceptance of any work or materials not in accordance with the Contract Documents.

4.1.5 Payment Due. Payment of an Application for Payment shall be due ten days after receipt by the Owner of the certification of the Application for Payment by the Design Professional.

4.1.6 Payment Due Dates and Interest. Should the Owner fail to pay a proper invoice within thirty calendar days of receipt, the Contractor shall notify the Owner in writing by certified or statutory mail. If the Owner fails to pay within five business days of receipt of the notice, the Contractor shall receive, in addition the sum named in the proper invoice, interest thereon at the rate of one half percent per month on the unpaid balance as may be due.

4.1.7 Payments for Change Order Work. Payments will not be made for any changes in the Work until a Change Order has been executed.

PART 2 – PAYMENTS WITHHELD

4.2.1 Payments Withheld.

4.2.1.1 Payments Withheld or Nullified. The Design Professional or the Owner may withhold or, on account of subsequently discovered evidence, nullify the whole or a part of any certificate to such extent as may be necessary to protect the Owner from loss because of the following conditions:

- Defective work not remedied.
- Claims or liens filed
- Failure of the Contractor to make payments properly to Subcontractor or Supplier for materials or labor.
- A reasonable doubt that the Contract can be completed for the balance then unpaid.
- Damage to a Separate Contractor or to the Owner or a third party.
- Failure to maintain a rate of progress consistent with the Milestones.
- Failure to supply enough skilled workers or proper materials.
- Court-ordered retention.
- State Tax Forms not on file.
- Failure to file required state and federal employer work authorization certificates or to comply with the federal employer work authorization program.
- Breach of this Contract

4.2.1.2 Withheld Payments Restored. When the conditions above are remedied, payment shall be made for amounts withheld because of them.

PART 3 - LIENS

4.3.1 Public Property Not Subject to Lien. The Contractor acknowledges that, pursuant to law, the Site is public property of the State of Georgia and is not subject to lien or levy. The Contractor will notify the Owner of any liens or levies against the Site of which it becomes aware. The Contractor shall cooperate with the Owner and shall use its best efforts to assist in securing the release of any liens or levies of which it becomes aware.

4.3.2 Notice of Commencement. A Notice of Commencement shall be filed by the Contractor with the Clerk of the Superior Court in the county in which the Project is located, pursuant to O.C.G.A. §13-10-62.

4.3.3 Release of Liens. Neither any part of the retainage nor the Final Payment shall become due until the Contractor, if required, shall deliver to the Owner a complete release of all liens or conditional release of lien upon payment or claims arising out of this contract in accordance with the Owner's specimen form (a copy of which will be provided to any bidder on request), or receipts in full in place thereof and, if required in either case, an affidavit that so far as he has knowledge or information the releases and receipts include all labor and materials for which a lien or claim could be filed; but the Contractor may, if any Subcontractor or claimant refuses to provide a release, furnish a bond satisfactory to the Owner to indemnify the Owner against any lien or claim. If any lien or claim remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all monies that the latter may be compelled to pay in discharging such lien or claim, including all costs and reasonable attorney's fees.

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SECTION 5 – CONTRACT ADJUSTMENTS, DISPUTES, AND TERMINATION

PART 1 – OWNER'S RIGHT TO SUSPEND OR STOP WORK

5.1.1 Owner's Right to Suspend Work. The Owner reserves the right, with or without the concurrence of the Design Professional, to suspend the Work at any time or from time to time at the Owner's sole discretion, upon giving Contractor five days advanced written notice thereof. If the Owner exercises this right and then resumes the Work covered hereby, Contractor shall be entitled upon timely claim to a Change Order for payment by Owner of any reasonable Actual Costs actually incurred by Contractor in connection with the suspension and resumption of the Work, as well as an extension in the time for performance of the Work to the extent Contractor is delayed by Owner's suspension, to include compensation based upon the rate for Time Dependent Overhead Costs. The Design Professional shall determine the time, which shall be binding upon both Owner and Contractor, as set forth in Section 3, Part 3.

5.1.2 Owner's Right to Stop Work. The Owner reserves the right, for itself and for any designated Construction Inspector retained by Owner, upon observation of apparent nonconforming Work, to immediately stop the affected Work. If the Work is later determined by the Design Professional to be in fact conforming Work, then Contractor shall be entitled upon timely claim to a Change Order for payment by Owner of any reasonable Actual Costs actually incurred by Contractor in connection with the stop Work order and resumption of the Work, as well as an extension in the time for performance of the Work to the extent Contractor is delayed by Owner's stop Work order. The Design Professional shall determine the time, which shall be binding upon both Owner and Contractor, as set forth in Section 3, Part 3.

5.1.3 Owner's Rights Independent from Rights and Duty of the Design Professional. The rights granted to Owner under this Article are independent of the duty and obligation of the Design Professional to stop the Work for non-compliant work or to issue Notices of Non-compliant work.

PART 2 – CONTRACT ADJUSTMENTS AND DISPUTES

5.2.1 General Provisions.

5.2.1.1 No Arbitration. There is no agreement to arbitrate any dispute arising under the Contract Documents. Any and all references to arbitration in any of the Contract Documents, including without limitation any exhibits, attachments or references, are hereby deleted and rendered null and void.

5.2.1.2 Continuation of the Work. Unless otherwise agreed in writing, and notwithstanding any other rights or obligations of either of the parties under any Contract Documents or Contracts, the Contractor must carry on with the performance of its contract services and the Work, including all duties and obligations hereunder, during the pendency of any Claim, dispute, and other matter in question or during any alternative dispute resolution proceeding, court proceeding, or other proceeding to resolve any Claim, dispute, and other matter in question, and the Owner will continue to make payments in accordance with the Contract Documents. The Owner, however, is under no obligation to make payments on or against such Claims, disputes, and other matters in question during the time required to resolve such Claims, disputes, and other matters in question.

5.2.2 General Claims for Contract Adjustments and Disputes.

5.2.2.1 General Claims of the Contractor. Should the Contractor suffer any injury or damage to person or property that Contractor reasonably believes a legal basis exists for liability on the part of the Owner, Program manager, or Design Professional, and that should result in an adjustment in the Cost of the Work or the Contract Time, such claim shall be made in writing in the form of a Request for Change Order to the Design Professional and copy the owner within fourteen days after such injury or damage is or has been observed. Any and all claims not made within said fourteen days are barred, waived, released, and discharged. The decision of the Design Professional is final and binding on the Contractor unless the Contractor protests the decision of the Design Professional and files a Statement of General Claim as set forth below.

5.2.2.2 Processing of General Claims. All claims must be filed and processed as a request for Change Order and subject to the processes and limitations set forth in Section 3 Part 2. If the requested Change Order is rejected, a protest may be made as set forth in Paragraph 5.2.2.3 below.

5.2.2.3 Protest; Statement of General Claim; Time of Submission. No protest of a claim decision of the Design Professional by the Contractor, whether said claim shall be accrued or prospective, shall be valid unless a "Statement of Claim" in writing and accompanied by vouchers and other supporting data shall have been filed with the Owner's Representative, or if there is no Owner's Representative, with the Owner by the Contractor not later than thirty days after the Design Professional's decision to reject the claim, time being of the essence. The "Statement of Claim" shall contain a concise and clear recital of the grounds and the legal basis upon which the claim is asserted, including a designation of the applicable provisions of the Contract Documents. The Statement of Claim shall indicate the dollar amount of the claim and the number of days of adjustment of the Contract Time. The Owner and Contractor shall endeavor to resolve the dispute in accordance with Article 5.2.3 below.

5.2.2.4 Claims by Subcontractors. No claim or protest shall be made by the Contractor solely on the ground that a Subcontractor, Supplier, or Trade Contractor has made a claim or protest against the Contractor. The Contractor must maintain its claim or protest against the Owner based upon the provisions of the Contract Documents and independent of any right the Subcontractor, Supplier, or Trade Contractor has against the Contractor. The Contractor shall defend the Owner from any claims or protests submitted by a Subcontractor, Supplier, or Trade Contractor asserted in violation of, or contrary to any provision of the Contract Documents.

5.2.3 Dispute Resolution.

5.2.3.1 Initial Dispute Resolution. If a dispute arises out of or relates to this Contract or its breach, the parties shall endeavor to settle the dispute first through direct discussions between the parties' representatives who have the authority to settle the dispute. If the parties' representatives are not able to promptly settle the dispute, they shall refer the dispute to the senior administrators of the parties who have the authority to settle the dispute, who shall meet within fourteen days thereafter. If the dispute is not settled by the senior administrators, the parties may submit the dispute to mediation in accordance with Paragraph 5.2.3.2.

5.2.3.2 Mediation. If the dispute cannot be settled pursuant to Paragraph 5.2.3.1, the parties may elect to submit the dispute to mediation. The parties agree to conclude such mediation within sixty days of electing mediation. The parties shall select a mutually agreeable mediator and shall share the cost of the mediator equally. Either party may terminate the mediation at any time after the first session, but the decision to terminate shall be communicated directly by the party's representative to the other party's representative and the mediator.

5.2.3.3 Multiparty Proceeding. All parties necessary to resolve a claim shall be parties to the same dispute resolution proceeding and shall share the costs equally. Appropriate provisions shall be included in all other contracts relating to the Work to provide for the consolidation of such dispute resolution procedures.

5.2.3.4 No Litigation. No litigation may be commenced without first following the process in this Article. Action may be filed in the Superior Court in Fulton County, Georgia, pursuant to OCGA §50-21-1, after the filing party provides thirty days written notice to the opposing party.

5.2.4 Certain Claims Excluded from General Claims.

5.2.4.1 All claims for Compensable Delay under Article 3.3.8.

5.2.4.2 All claims for changes to the Work under Article 3.2.10, Article 3.2.11, Article 3.2.12, and under Article 3.2.14.

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PART 3 - TERMINATION

5.3.1 Owner's Right to Terminate Contract for Convenience.

5.3.1.1 Termination for Convenience. The Owner may at any time, and for any reason or without any reason or cause, terminate this Contract by written notice to the Contractor specifying the termination date, without cause and irrespective of whether or not Contractor is in default of any of its obligations hereunder. The effective date of termination shall not be earlier than seven days from the date of confirmed receipt of the written notice.

(a) The Contractor shall: (i) stop the Services or the Work (as applicable); (ii) place no further orders or Subcontracts for materials, labor, services or equipment; and (iii) terminate all material and equipment orders and Subcontracts to the extent terminable (unless otherwise directed by Owner in writing) and advise Owner of all materials, equipment and other items which cannot be canceled or which are already delivered and allow Owner to participate in the salvage or disposition thereof.

(b) If Owner terminates this Contract pursuant to this Section prior to the commencement of the Construction Stage, Contractor shall, as soon as practical after receiving notice of termination submit to Owner an Application for Payment for all services performed through the date of receipt of the notice of termination, for which payment has not been previously made pursuant to the terms of this Contract.

(c) If Owner terminates this Contract pursuant to this Section after commencement of the Construction Stage, Contractor shall, as soon as practical after receiving notice of termination, submit to Owner an Application for Payment showing all of the costs incurred by Contractor in the performance of the Work terminated through the date of receipt of the notice of termination. The phrase "costs incurred by Contractor in the performance of the Work terminated" as used herein shall be deemed to include:

- Subcontract costs of Work completed;
- Cancellation fees in regard to equipment and materials ordered;
- Cost of all materials and equipment ordered which cannot be cancelled; less actual proceeds received upon the disposition thereof;
- Field Work accomplished;
- Permit, engineering, bond and inspection fees;
- All other direct costs actually incurred by Contractor that can be demonstrated by invoice, canceled check, or other appropriate documentation;
- General Conditions costs and profit incurred through the date of termination.
- Job Site and termination costs for ten business days after the date of termination to be paid at the daily rate Time Dependent Overhead Costs.

5.3.1.2 Release. Acceptance of payment by the Contractor shall constitute a waiver of all further claims by Contractor against Owner under the Contract, and shall be Contractor's exclusive remedy for termination of the Contract.. Notwithstanding anything to the contrary contained in the Contract Documents, in no event shall Contractor be entitled to any payment on account of accident or lost profits or consequential damages in connection with any termination of the Contract, or otherwise in connection with the Contract.

5.3.1.3 Condition Precedent to Payment. As a condition precedent to receiving the payment set forth in this Article 5.3.1, Contractor shall deliver to the Owner all papers, documents, assignments and agreements relating to the Project, in particular the entire Contract Documents (including ownership and copyright thereof).

5.3.1.4 Assignment of Rights, Trade, and Subcontracts.

5.3.1.4.1 Assignment. If requested, Contractor shall assign to the Owner or to an entity of Owner's choice any or all of Contractor's contractual rights in respect thereof, so that the assignee shall be fully vested with all rights and benefits of Contractor under such papers, documents and agreements, together with releases and waivers of lien in the same manner as would be required upon Final Completion. The Owner may also request the assignment from Contractor to Owner or to the entity of Owner's choice of any or all Subcontractors and supplier agreements entered into by Contractor and in that event the assignee shall be solely obligated to the Subcontractors and Suppliers under such contracts or agreements for all sums payable thereunder and not previously paid by the Owner to Contractor.

5.3.1.4.2 Cessation of Entitlement. Upon the Contractor's assignment of agreements, contracts, Trade Contracts and/or Owner's payment of monies due Contractor, Contractor shall be entitled to no further compensation of any kind from Owner and shall have no further obligation only with regard to the assigned agreements, contracts, Subcontractors and Suppliers.

5.3.2 Owner's Right to Declare Default and/or Terminate Contract for Cause.

5.3.2.1 Termination for Cause. In the event that any provisions of this Contract are violated by the Contractor, through its own forces or by any of its subcontractors, the Owner may serve written notice upon the Contractor and the surety of the Owner's intention to declare default and terminate the Contractor. Unless within ten days after the serving of such notice, such violation or delay shall cease and satisfactory arrangement for correction be made, the Contractor shall be in default. Such notices shall outline the reasons for such intention to terminate the contract. In such event of any such default, the Owner shall immediately declare default and serve notice thereof upon the surety and the Contractor, and the Owner shall demand that the surety perform in accordance with its bond. If the surety fails to exercise its election under the bond or does not commence performance thereof within the time required by the bond, the Owner may take over the Work and prosecute the same to completion for the account of and at the expense of the Contractor. The Contractor and its surety shall be liable to the Owner for any excess cost to the Owner. The Owner may take possession of and utilize in completing the Work such materials, appliances, and plant as may be on the Site and necessary thereto.

5.3.2.2 Grounds for Issuance of Notice of Declaration of Default. It shall be a sufficient ground for the issuance of a notice of declaration of default that the Contractor has been unfaithful or delinquent in the performance of the Contract or any part of it in any respect. Other specific grounds and defaults include, but are not limited to:

(a) *Non-compliant Work*. Without limitation of the foregoing and without subtracting from any right or defense of the Owner under other provisions of the Contract Documents, the Contractor acknowledges and agrees that it is grounds for issuance of a notice of declaration of default if the Contractor shall have failed for any reason to remedy a breach of a Notice of Non-compliant Work.

(b) *Failure to Prosecute the Work*. If the Contractor refuses or fails to supply enough properly-skilled workmen or proper materials, or if it fails to make proper payment to Subcontractors for materials or labor, or if it fails to diligently prosecute the Work in accordance with the Contract Documents, then the Owner, without prejudice to any right or remedy and after giving the Contractor written notice of the Owner's Intent to Declare Default, and the Contractor fails to cure or fails to commence and thereafter diligently prosecute Work necessary to cure the violation, may declare the Contractor to be in default.

(c) *Other Failures of the Contractor*. If the Contractor, without limitation, makes a general assignment for the benefit of its creditors, or if a receiver is appointed on account of its insolvency, or if it persistently disregards laws, ordinances, rules, regulations or orders of any public authority having jurisdiction over the Project, or if it otherwise is guilty of a violation of any provision of this Contract, then the Owner may, without prejudice to any right or remedy and after giving the written notice of the Owner's Intent to Declare Default, and the Contractor fails to cure or fails to commence and thereafter diligently prosecute Work necessary to cure the violation, may declare the Contractor to be in default.

5.3.2.3 Owner's Right to Prosecute the Work. Time being of the essence, if the Contractor shall be declared in default, both the Contractor and the Surety agree that the Owner may, after giving the Contractor and Surety the required notice and time under the bond if any is required, without prejudice to any other remedy and without invalidating the performance bond, make good such deficiencies and may deduct the cost thereof from payment due the Contractor or, at the Owner's option and without prejudice to the Owner's rights against the Contractor and Surety, the Owner may terminate the Contractor and take possession of the Site and of all materials, equipment, tools and construction equipment and machinery thereon owned by the Contractor and finish the Work by whatever method the Owner shall deem expedient.

5.3.2.4 Effect of Later Determination. In the event the parties agree or a court of competent jurisdiction determines (or the parties agree to settle with a consent determination) that a default is wrongful or not the fault of the Contractor, the termination shall be considered to be a Termination for Convenience and the sole remedy available to the Contractor shall be the contractual treatment of the termination pursuant to Article 5.3.1 above and without any other damages or relief.

5.3.3 Termination by Owner for Abandonment by Contractor. Both the Contractor and the Surety agree that, after fourteen calendar days' written notice to the Contractor, the Owner may terminate the Contractor if the Contractor abandons the Project. If such termination occurs, the Owner shall credit the Contractor for Work satisfactorily completed, less any costs and liquidated damages the Owner suffers in correcting the Work, re-contracting and starting-up a replacement contractor, and completing the Project, including all warranties.

5.3.4 Contractor's Right to Terminate.

5.3.4.1 Contractor's Right to Suspend Work. The Contractor may, upon seven days written notice to the Owner and the Design Professional, suspend the Work without penalty for the following reasons:

5.3.4.1.1 Order of Court or Superior Public Authority. If any court or other superior public authority issues an order that affects the Work and the order results from no act or fault of the Contractor, the Contractor may stop the affected Work. In addition, the Contractor may suspend Work as a result of an act of government, such as a declaration of a national emergency, making critical materials unavailable.

5.3.4.1.2 Failure to issue Certificate of Payment. Work may be suspended if the Design Professional should fail to certify without just cause any Application for Payment within thirty days after said certification is due from the Design Professional. This ground terminates upon any payment of the Application for Payment by the Owner.

5.3.4.2 Contractor's Right to Terminate Contract for Nonpayment. If the Owner fails to pay the Contractor when payment is due, the Contractor must give written notice of the Contractor's intention to terminate this Contract. If the Owner fails to provide the Contractor payment or written notice of a dispute as to the amount sought by the Contractor within ninety days after receipt of the Contractor's written notice, the Contractor may terminate this Contract. Upon such termination the Owner will pay the Contractor for the Work properly executed to date, and, upon timely claim therefore, for any proven loss sustained or cost incurred upon any materials, equipment, tools, construction equipment and machinery, and cancellation charges on existing obligations of the Contractor.

5.3.5 Limitation on Payments. For terminations pursuant to Article 5.3.2 and 5.3.4, the Contract Sum shall be deemed earned only to the extent of an amount that bears to the total Contract Sum the same ratio that the Work in place at the time of termination bears to the total Work, as reasonably determined by the Design Professional, and approved by the Owner.

5.3.6 Notices of Termination Required. Notwithstanding any other provision of this Contract, no party may terminate this Contract, regardless of reason, unless the terminating party shall first issue a written Notice of Termination or of Default to the terminated or defaulted party by Statutory Mail or Certified Mail, Return Receipt Requested.

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SECTION 6 - PROJECT COMPLETION

PART 1 – MATERIAL COMPLETION

6.1.1 Material Completion.

6.1.1.1 Material Completion Defined. Material Completion is when the Work or designated portion thereof is complete in accordance with the Contract Documents so that the Owner and its Using Agency can occupy and utilize the Work for its intended use. Material Completion shall include issuance of any required Health Department inspections and any necessary certificates to operate, certificate of occupancy, as well as complete operation of all applicable building systems including, but not limited to, mechanical, electrical, plumbing, fire protection, fire alarm, security, elevators, life safety, and accessibility. Material Completion occurs when the Work is complete, except for Minor Items or Permitted Incomplete Work or Warranty Complaint Items (see Article 6.6.3), and a Certificate of Material Completion is obtained.

(a) Material Completion and Occupancy Date Defined. The date designated in the Contract for Material Completion to be achieved.

(b) Minor Item Defined. A Minor Item is a portion or element of the Work—

- that can be totally complete within thirty days; and
- that can be completed while the Using Agency occupies the Work without impeding or interfering with either the Using Agency's use and occupation of the Work or the Contractor's ability to complete the Minor Item; and
- that will not interfere with the complete use and enjoyment of the project by the Using Agency.

(c) Permitted Incomplete Work Defined. Permitted Incomplete Work is work that is incomplete through no fault of the Contractor, as determined by the Owner, including, but not limited to, seasonal test and balance, seasonal landscaping, scheduled elevator inspection or maintenance, incomplete work due to failure of Separate Contractors to complete work, and the like.

6.1.1.2 When Material Completion Required. Material Completion shall be achieved within the Contract Time and by the Material Completion and Occupancy Date, as amended. Failure by the Contractor to achieve Material Completion by not later than the Material Completion and Occupancy Date, as amended, shall be sufficient cause for the assessment of Liquidated Damages.

6.1.2 Effect of Achieving Material Completion. Upon the date when Material Completion is actually achieved, the following matters are conclusively determined:

- *Occupancy of the Work*. The Using Agency may immediately occupy the Work without restriction.
- *Warranty Periods*. All warranties begin to run from the date Material Completion is achieved.
- *Utilities.* All utilities become the responsibility of the Using Agency.
- *Insurance*. The Using Agency is responsible for all insurance for the Project.
- *Liquidated Damages.* The Liquidated Damages daily rate is reduced to zero.
- *Payment for Material Completion*. The Contractor may request payment of the remaining contract balance, including retainage, less the amounts credited the Owner or incurred as Liquidated Damages, and less the amounts withheld for the punchlist by reason of Minor Items or Permitted Incomplete Work.

6.1.3 Effect of Failure to Achieve Material Completion. Should Material Completion not be achieved by the Material Completion and Occupancy Date, as amended, the following matters are conclusively determined:

- *Breach of Contract*. As time is of the essence in the completion of the Work, the Contractor is in breach of the Contract and is subject to default.
- *Liquidated Damages*. Liquidated Damages at the specified daily rate in the Contract begin to accrue and are payable on the day immediately following the Material Completion and Occupancy Date.

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PART 2 – FINAL COMPLETION

6.2.1 Final Completion.

6.2.1.1 Final Completion Final Completion shall be evidenced by the Design Professional's Certificate of Final Completion. Final Completion includes completion of all Permitted Incomplete Work (*see* Section 6, Part 1).

6.2.1.2 When Final Completion Required. Minor Items shall be completed as expeditiously as possible, but not later than thirty days after Material Completion of the Work. Permitted Incomplete Work shall be completed as expeditiously as possible, within the time reasonably set by the Design Professional. The Certificate of Final Completion shall not be issued until all Minor Items and Permitted Incomplete Work are completed or waived.

6.2.1.3 Waiver, Deductions for Uncorrected Work. If the Design Professional and Owner deem it inexpedient to correct Work not done in accordance with Contract Documents, The Contractor's duty to complete may be waived and a deduction from the Contract Sum may be made; in the Owner's sole and complete discretion.

6.2.2 Effect of Achieving Final Completion. Upon the date when Final Completion is achieved and the Design Professional's Certificate of Final Completion is issued, the following matters are conclusively determined:

6.2.2.1 Project Completion. The Project and the Work are complete.

6.2.2.2 Payment for Final Completion. All amounts withheld from Payment for Material Completion and not previously paid to the Contractor or credited to the Owner, as set forth in Section 6, Part 4, are payable upon receipt of a complete final pay request from the Contractor.

6.2.3 Effect of Failure to Achieve Final Completion. Should Final Completion not be achieved within the time specified, as amended, the Owner may issue to the Contractor a fourteen-day notice as a final warning to complete the Work. If Final Completion is not achieved by the end of the fourteenth day from the date of the Notice, the following matters are conclusively determined, subject to any request for extension of time as set forth in paragraph 6.2.3.3 below:

6.2.3.1 Breach of Contract. As time is of the essence in the completion of the Work, the Contractor is in breach of the Contract and is subject to default.

6.2.3.2 Ineligibility to Bid Upon State Contracts. The Contractor is ineligible to bid or propose on any contract of the Owner, the Georgia State Financing and Investment Commission, the Board of Regents of the University System of Georgia or any unit of the University System of Georgia, or the Georgia Department of Administrative Services. In the event a bid has been submitted but the bid award has not been made, the Contractor's ineligibility requires that its bid be rejected.

(a) Automatic Restoration of Eligibility to Bid. The Contractor's eligibility to bid upon state contracts shall be restored automatically as of the date of achievement of Final Completion as evidenced by the Certificate of Final Completion.

(b) Application to Reinstate Eligibility to Bid. If the Contractor never achieves Final Completion, the Contractor's eligibility to bid or propose on state contracts may be reinstated upon the following:

(i) Not earlier than eighteen months after the date of failure to achieve Final Completion, a written application requesting reinstatement of eligibility to one of the following: the Director, Construction Division, GSFIC; the Vice Chancellor for Facilities, Board of Regents; or the Commissioner, Department of Administrative Services; and
(ii) The showing of good and just cause to believe that the actual achievement of Final Completion was impossible, or the showing of other good and just cause that the Contractor's eligibility should be reinstated.
(iii) The Contractor may request a personal presentation in the application.

6.2.3.3 Extension of Time for Final Completion. The Contractor may file a request for an additional extension of time in the manner prescribed in Section 3, Part 3, and the effects of Failure to Achieve Final Completion shall be suspended until the Design Professional's decision. Should the Design Professional grant the application for extension of time generally, the time for achieving Final Completion shall be adjusted accordingly. Should the Design Professional grant the application for extension of time for a specific item of Work, that item of Work shall be deemed Permitted Incomplete Work with a specified final completion date.

PART 3 – INSPECTIONS FOR COMPLETION OF THE WORK

6.3.1 General Responsibility of the Contractor for Inspection. The Contractor acknowledges and agrees that it has an indivisible, non-delegable, and nontransferable contractual obligation to the Owner to make its own inspections of the Work at all stages of construction; and it shall supervise and superintend the performance of the Contract in such manner as to enable it to confirm and corroborate at all times that all work has been executed strictly in accordance with the specifications and materials designated in the Contract Documents. The Contractor's inspections are also for the purpose of permitting the Contractor to accurately represent that (a) its certifications on Applications for Payment are true and correct and (b) its notices of readiness for inspections are true and correct. Accordingly, the Contractor acknowledges and agrees that it may not defend or excuse any deviation from the Contract Documents on the ground (a) that another person or party failed to bring the deviation to its attention, or (b) that any Subcontractor is at fault.

6.3.2 Notice of Readiness for Inspection for Material Completion.

6.3.2.1 Preparation of Initial Punchlist. Prior to the Material Completion and Occupancy Datethe Contractor shall correct all non-compliant or incomplete work and shall then prepare an initial punchlist itemizing to the best of the Contractor's knowledge all Minor Items and Permitted Incomplete. The Contractor shall consult with the Design Professional on the initial punchlist, to reach consensus on Minor Items and Permitted Incomplete Work.

6.3.2.2 Contractor's Notice of Inspection. The Contractor shall give the Design Professional and Owner Notice of Readiness for Inspection for Material Completion, together with the initial punchlist, in the following words:

> *The work on the Contract for the [show name of Project as it appears in the Contract] having been materially completed, I request that the Design Professional perform an Inspection for Material Completion promptly in accordance with Section 6 of the General Conditions. I have attached the initial punchlist.*

6.3.2.3 Additional Requirements for Inspection for Material Completion. The Contractor shall not request any Inspection for Material Completion before the Contractor has provided to the Design Professional the following:

- A copy of the initial test and balance report on the heating, ventilating, and air conditioning system;
- A copy of the facility operation and maintenance instructions, and any other documents specified by the Design Professional in Division 1 of the Specifications; and
- A certification from the Contractor that all building systems specified in Paragraph 6.1.1.1 above are operational, have been tested, and a valid manufacturer's warranty has been issued. "Placing into operation" is defined as operating the equipment for a sufficient period of time to determine that it is performing properly.

6.3.3 Conducting the Inspection for Material Completion. The Design Professional shall conduct the Inspection for Material Completion within seven days of receipt of the notice of inspection. The Design Professional shall confirm the initial punchlist, shall add or delete Minor Items or Permitted Incomplete Work as appropriate, shall assign values to each item on the punchlist, and shall assign completion dates for the items of Permitted Incomplete Work. At the completion of the Inspection for Material Completion, the resulting punchlist shall be finalized by the Design Professional and provided to the Contractor within five days and shall become the Final Punchlist. Upon determination that Material Completion has been achieved, the Design Professional shall issue a Certificate of Material Completion.

6.3.4 Notification to Using Agency of Site Visits by the Contractor or Subcontractors. Following the issuance of a Certificate of Material Completion, the Contractor or its Subcontractors shall not visit the Site without first giving notice to the Using Agency and the Owner.

6.3.5 Final Completion. Not more than thirty days after Material Completion, and upon completion of the Final Punchlist (including *all* Minor Items and Permitted Incomplete Items as are due to be completed), the Contractor shall request Inspection for Final Completion. If there are remaining Permitted Incomplete Work not yet due, upon completion of the final inspection, the Design Professional will issue a Report of Interim Inspection, noting any Permitted Incomplete Work that remains to be accomplished and the date by which it is

to be completed. In the event any Minor Item is determined to be incomplete, the Owner may give the fourteen-day notice of failure to complete the Work, as set forth in Article 6.2.3.

6.3.7 Conducting the Inspection for Final Completion. When all Permitted Incomplete Work has been completed or scheduled for completion, the Owner shall call for and the Design Professional shall schedule the Final Inspection with the Owner and Contractor. The Design Professional shall conduct the Inspection for Final Completion and if all Permitted Incomplete Work has been completed, shall issue the Certificate of Final Completion. Final Payment and any remaining funds may, upon an Application for Final Payment, be paid to the Contractor. Any Final Documents not yet submitted must be submitted with the Application for Final Payment. In the event any item of Permitted Incomplete Work is determined to be incomplete and the date for its completion has passed, the Owner may give the fourteen-day notice of failure to complete the Work, as set forth in Article 6.2.3.

PART 4 – FINAL DOCUMENTS

6.4.1 Final Documents.

6.4.1.1 Final Documents. Final Documents consist of all documents set forth in Division 1 of the specifications, as well as all warranties and guarantees required by the Contract Documents and shall be submitted not later than the Application for Payment for Material Completion. Final Documents, including but not limited to the following, must be submitted to the Owner and Using Agency:

(a) Affidavits.

- A Non-Influence Affidavit in the exact form as shown in Section 7, Forms.
- A Statutory Affidavit in the exact form as shown in Section 7, Forms. Any exceptions to the Statutory Affidavit are subject to the approval of the Owner.

(b) Bonds.

- A Five-Year Bond for Roofs and Walls as shown in Section 7, Forms, written by a surety authorized to do business in the State of Georgia and in the penal sum of the actual cost of the exterior walls, wall cladding, wall components, wall insulation, roof insulation, roof deck and roof.
- Any Bonds to Discharge Claim issued to Subcontractors and Suppliers as shown in Section 7, Forms.

(c) Marked-up Construction Documents. The Contractor shall provide a complete set of Marked-up Contract Documents to the Design Professional, which set shall reflect all changes caused by RFIs, field changes, Change Orders, or observed changes by the Contractor or subcontractor(s) for the purpose of the Design Professional's issuance of Record Documents to the Owner.

(d) Operation and Maintenance Data and Instructions and Training. The Contractor shall furnish proper written instructions to the Owner and Using Agency on operation and maintenance of all mechanical and electrical equipment. The Contractor shall provide training to the Using Agency in the operation and maintenance of all mechanical and electrical systems in the presence of the Design Professional and Owner and shall give notice in writing to the Design Professional, Owner and Using Agency at least fifteen days prior to the date it is proposes for the training. For all items of mechanical or electrical equipment or apparatus installed that require operation or maintenance after occupancy, the Contractor shall furnish and deliver to the Owner and Using Agency complete brochures and data as prepared and published by the manufacturers covering details of operation and maintenance.

(e) Certificates of Manufacturers for Major Components. Certificates of Manufacturers shall be provided for elevators, moving walks, dumbwaiters, escalators, lifts, major components of HVAC and plumbing systems, e.g., cooling towers, compressors, condensers, absorption units, chiller units, fan coil units, air handling units, boilers, base mounted pumps, temperature controls, chemical feed systems; sewage pumps and water treatment systems, and incinerator systems; and major components of electrical systems. Start-up, testing, and placing into operation shall be performed by the field representative(s) of the manufacturer(s), and certificate(s) of the manufacturer(s) shall be filed with the Owner on the letterhead(s) of the manufacturer(s) in which the manufacturer(s) certifies or certify that "the equipment has been installed in strict compliance with the recommendations of the manufacturer(s) and is operating properly," in the format shown in Section 7, Forms. The manufacturer shall list in the certificate the item or items furnished to the job and the date, name, or other positive means of identifying any supplementary documents containing the recommendations of the manufacturer, with a copy of each of the supplementary documents attached to the certificate.

(f) Final Certification of Costs. For proper capital asset reporting of the Project, the Contractor shall submit its Final Certification of Costs in the format set forth in Section 7, Forms.

6.4.2 Presentation of Final Documents. At the time of the Inspection for Material Completion the Contractor will provide the Owner and Using Agency with two complete sets of the Final Documents, warranties, and guarantees required by the Contract Documents.

6.4.3 Keys. Unless an alternative locking or keying system is specified, a minimum of two sets of keys, with tags indicating room number or room description or door each key is intended to fit attached to each key, shall be delivered to the Owner and Using Agency. Contractor shall prepare and furnish with the keys an itemized key schedule listing the room number or room description or door, serial number of key, and number of keys delivered for each door or lock.

PART 5 – PAYMENT REQUIREMENTS – MATERIAL AND FINAL COMPLETION

6.5.1 Payment for Material and Final Completion. Payments for Material or Final Completion shall be due 10 days after receipt by the Owner of the application for payment upon achievement and certification of Material or Final Completion, provided that Final Documents have been submitted. Payment shall be made by a check payable jointly to the Contractor and surety and shall be mailed to the surety, unless the surety has provided a consent of surety to pay the Contractor directly.

6.5.2 Application for Payment.

6.5.2.1 Certification of Contractor. The Contractor shall certify, over his own signature, that the Work provided for by the Contract Documents has been completed under the terms and conditions thereof, and that:

(a) *For Material Completion*: That the entire balance of the contract, including retainage, is due and payable, except for those amounts determined by the Design Professional to be withheld from retainage due to (i) credits due to the Owner, (ii) Minor Items or (iii) Permitted Incomplete Work (*see* Article 6.5.3 below).

(b) *For Final Completion:* That the entire balance of the contract is due and payable.

(c) *Supporting Documentation*.

- *Financial Data*. The Contractor shall submit evidence satisfactory to the Design Professional that all payrolls, material bills, and other indebtedness connected with the work have been paid.
- *Warranties, Affidavits and Bonds*. The Contractor shall attach copies of the Final Documents, warranties, affidavits and bonds set forth in Article 6.4.1 above, execute the payment certification and forward it directly to the Design Professional.

6.5.3 Release of Contractor's Retainage.

6.5.3.1 Punchlist Values. Upon the development of the Final Punchlist, the Design Professional will assign a value for each Minor Item and item of Permitted Incomplete Work.

6.5.3.2 Establishing the Amount to be Withheld for Punchlist Items. In general, the amount to be withheld from the Payment for Material Completion and to be paid upon Final Completion shall be equal to 200% of the Design Professional's value of completing the Work for each Minor Item or Permitted Incomplete Work. The following additional amounts to be withheld shall be applied where applicable.

- *Mechanical and HVAC Systems*. Until such time as the Design Professional shall have certified that the heating system has been balanced under seasonable weather conditions, the amount withheld shall in no event be less than $1,000.00.
- *Certificates*. For each Final Document item or certificate item not submitted, the sum of $500.00 shall be withheld until such item shall have been supplied at Final Completion.

6.5.4 Effect of Payment for Material Completion and Release of Claims. Owner shall process the Payment for Material Completion as expeditiously as possible in accordance with the certification of the Design Professional, but interest shall not accrue until thirty (30) days have elapsed from receipt, unless error is found in the application or supporting documents. Acceptance of Payment for Material Completion by the Contractor shall operate as settlement, waiver, release, discharge and payment in full of all claims against Owner of any nature arising out of the Project except for the work associated with the Minor Items and the Permitted Incomplete Work.

6.5.5 Final Payment. Owner shall process the Final Payment expeditiously as possible in accordance with the certification of the Design Professional, unless error is found in the application or supporting documents. Final Payment shall not be paid until all Final Documents shall have been submitted. No interest shall accrue on Final Payment until sixty (60) days after all Final Documents have been submitted.

6.5.6 Effect of Final Payment and Release of Claims. Acceptance of Final Payment by the Contractor shall operate as settlement, waiver, release, discharge and payment in full of all claims against Owner of any nature arising out of the Project.

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PART 6 – CORRECTION OF WORK AFTER FINAL PAYMENT

6.6.1 Non-Compliant or Defective Work. Neither the Design Professional's Certificate of Final Completion, nor any decision of the Design Professional, nor payment, nor any provision in the Contract shall relieve the Contractor of responsibility for faulty materials, faulty workmanship, or omission of contract work, and it shall remedy any defects or supply any omissions resulting therefrom and pay for any damage to other work resulting therefrom.

(a) Notice of Non-Compliant or Defective Work. The Owner shall give notice of observed defects or omissions with reasonable promptness. Attached to the notice shall be a Notice of Non-compliant work.

(b) Correction of the Work. Within the space of time designated in Notices of Non-compliant work and without expense to the Owner, the Contractor shall correct, remedy, replace, re-execute, supply omitted work, or remove from the premises all work designated as non-compliant by the Design Professional. The Contractor shall give prompt notice in writing to the Design Professional, with copy to the Owner, upon completion of the supplying of any omitted work or the correction of any work designated as non-compliant by the Design Professional. In the absence of said notice, it shall be and is presumed under this Contract that there has been no correction of the non-compliant work or supplying of omitted work. If the Contractor does not remove, make good the deficiency, correct, or remedy faulty work, or supply any omitted work within the space of time designated in Notices of Non-compliant work, then the Owner, after ten days' notice in writing to the Contractor, may remove the work, correct the work, remedy the work or supply omitted work at the expense of the Contractor. In case of emergency involving health, safety of property, or safety of life the Owner may proceed at once with correction of the Work without waiving any rights of the Owner. Correction of defective work executed under the plans and specifications or supplying of omitted work whether or not covered by warranty of a subcontractor or supplier, remains the primary, direct responsibility of the Contractor.

(c) Duration of Obligation to Correct. The foregoing obligation of the Contractor shall remain in effect until the expiration of the statute of limitations covering the Work.

6.6.2 Warranty and Guaranty. As additional security for the fulfillment of such obligation, but in no way limiting the same, the Contractor warrants and guarantees (1) that all work executed under the plans and specifications shall be free from defects of materials or workmanship for a period of one year from the date of Material Completion, and (2) that for not less than one year from the date of Material Completion, or for such greater space of time as may have been designated in the specifications, products of manufacturers shall be free from defects of materials and workmanship. Whenever written guaranties or warranties are called for, the Contractor shall furnish the aforesaid for such period of time as may be stipulated. The aforesaid instruments shall be in such form as to permit direct enforcement by the Owner against any subcontractor, materialmen, or manufacturer whose guaranty or warranty is called for. The remedies stated in this article are in addition to the remedies otherwise available to the Owner, do not exclude such other remedies, and are without prejudice to any other remedies. The Contractor further agrees that:

(a) The Contractor is jointly and severally liable with its Subcontractors, Trade Contractors, Suppliers, and manufacturers;

(b) The warranties and guaranties of the Subcontractors, Trade Contractors, Suppliers, and manufacturers are provided by the Contractor for purposes of performance under this article, and the Contractor, ratifies them by its warranty and guaranty;

(c) Service of notice on the Contractor that there has been breach of any warranty or guaranty will be sufficient to invoke the terms of this article;

(d) The Contractor shall bind its Subcontractors, Trade Contractors, Suppliers, and manufacturers to the terms of this article; and

(e) The calling for or the furnishing of written warranties shall in no way limit the contractual obligation of the Contractor to correct the work as set forth in this Part

6.6.3 Warranty Complaint Item Procedure.

(a) Notice of Warranty/Guaranty Complaint Items. The Owner and Using Agency may provide notice of warranty work by a warranty complaint letter, sent by statutory mail or facsimile to the Contractor. The letter should outline the complaint item in non-technical language. In emergency situations, the initial notification may be oral to a person or office designated by the Contractor. The Contractor shall respond promptly to all such notices.

(b) Duty to Correct. During the one year period of the warranty and guaranty, any defects of material or workmanship that become apparent shall be the responsibility of the Contractor until and unless the Contractor can show abuse or design defect. The Contractor shall immediately correct all defects that become known during the one year period at no cost to the Owner unless notice is given to the Design Professional, Owner and Using Agency, prior to correcting the defect that the cause of the defect is the result of abuse or design deficiency.

(c) Initial Response. When the Using Agency, the Owner, or the Design Professional notifies the Contractor of a defect, the Contractor will visit the site to review the complaint within five days and shall promptly correct the Work. If the

Contractor fails to respond within this time limit, the Owner may correct the defect or malfunction and charge the Contractor for the Work. The Contractor shall give notice in writing to the Owner when corrections have been completed.

(d) Design Defect or User Abuse. If the Contractor believes that a design defect or user abuse has caused the malfunction or defect, he will notify the Design Professional and the Design Professional will issue a formal decision in his capacity as Design Professional and initial interpreter of the conditions of the contract. If the Contractor disagrees with the Design Professional's response, he shall protest to the Owner in accordance with Section Five Part two. If it is determined the complaint is not the responsibility of the Contractor, the Contractor shall be promptly paid for the cost of the corrective work.

(e) Emergency Situations. If the condition is an emergency, this will be communicated to the Contractor with the request that corrections are to be accomplished immediately. The Contractor shall respond to the notice in emergency situations within twenty-four hours. If the Contractor fails to respond within this time limit, the Owner may correct the defect and charge the Contractor for the Work. If it is determined the complaint is not the responsibility of the Contractor, the Contractor shall be promptly paid for the cost of the corrective work. The Contractor shall give notice in writing to the Owner when corrections have been completed.

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SECTION 7 – FORMS INDEX

FORMS INDEX:

Performance Bond
Payment Bond
Certificates of Compliance – Federal and State Work Authorization Programs
Non-Influence Affidavit
Statutory Affidavit
Five Year Bond on Roofs and Walls
Specimen Certificate of Manufacturer
Certificate of Insurance
Required Endorsement for CGL Policy
Bond to Discharge Claim
Change Order Form
Application for Payment Form
Subcontractor Retainage Release Certificate
Final Cost Certification
Certificate of Material Completion
Certificate of Final Completion

FORMS SET:

The forms identified in this Section are the same as those forms found in Section 7 of the current full form Design-Bid-Build construction contract, are incorporated by reference herein, and shall be executed in substantial conformance as required or convenient under the Contract Documents.

A Forms Set in either hard copy or electronic format is available from the Owner.

SECTION 010100
SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS:

A. This project is located at Fort Valley State University in Fort Valley, Georgia.

B. This contract is defined in the Contract Documents to include, but not necessarily to be limited to selective demolition and upgrades to replace the chillers at Myers Hall and at the Pettigrew Center.

C. This work will be constructed under a single prime contract.

1.3 PHASED WORK SEQUENCE:

A. The Contractor shall meet with the Using Agency to develop phased construction schedule.

1.4 CONTRACTOR USE OF PREMISES:

A. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. Owner Occupancy: Allow for Owner occupancy and use by the public.
2. Driveways, Entrances, Loading Docks: Keep clear and available to the Owner, the Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.5 OCCUPANCY REQUIREMENTS:

A. Full Owner Occupancy: The Owner will occupy the sites during the entire construction period. Cooperate with the Owner during construction operations to minimize conflicts and facilitate owner usage. Perform the Work so as not to interfere with the Owner's operations. Repair damage caused by construction operations. Take all precautions necessary to protect the buildings and their occupants during the construction period.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

(Not Applicable)

END OF SECTION 010100

SECTION 010270
APPLICATION FOR PAYMENT

PART 1 - GENERAL

1.1 GENERAL:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.

1.2 SCHEDULE OF VALUES:

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of the Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
   a. Contractor's Construction Schedule.
   b. Application for Payment forms, including Continuation Sheets.
   c. List of subcontractors.
   d. Schedule of allowances.
   e. List of products.
   f. List of principal suppliers and fabricators.
   g. Schedule of submittals.
2. Submit the Schedule of Values to the Owner's Representative at the earliest possible date but no later than 7 days before the date scheduled for submittal of the initial Applications for Payment.

1.3 APPLICATIONS FOR PAYMENT:

A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Owner's Representative and paid for by the Owner.

B. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.

C. Payment-Application Times: Each progress-payment date is indicated in the Agreement. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

D. Payment-Application Forms: Use AIA Document G702 and Continuation Sheets G703 as the form for Applications for Payment.

E. Application Preparation: Complete every entry on the form. Include notarization and execution by a person authorized to sign legal documents on behalf of the Contractor. The Owner's Representative will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and the Contractor's Construction Schedule. Use updated schedules if revisions were made.
2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.

F. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to the Project Manager by a method ensuring receipt within 24 hours. One copy shall be complete, including waivers of lien and similar attachments, when required.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

(Not Applicable)

END OF SECTION 010270

SECTION 010350
MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section specifies administrative and procedural requirements for handling and processing contract modifications.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Submittals" for requirements for the Contractor's Construction Schedule.
2. Division 1 Section "Application for Payment" for administrative procedures governing Applications for Payment.
3. Division 1 Section "Substitutions" for administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 MINOR CHANGES IN THE WORK:

A. The Project Manager shall issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or Contract Time, on AIA Form G710, Architect's Supplemental Instructions.

1.4 CHANGE ORDER PROPOSAL REQUESTS:

A. Owner-Initiated Proposal Requests: The Project Manager shall issue a detailed description of proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time. If necessary, the description shall include supplemental or revised Drawings and Specifications. Use AIA Document G709 for Change Order Proposal Requests.

B. Contractor-Initiated Proposals: When latent or unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Project Manager. Use AIA Document G709 for Change Order Proposal Requests.

1.5 CONSTRUCTION CHANGE DIRECTIVE:

A. Construction Change Directive: When the Owner and the Contractor disagree on the terms of a Proposal Request, the Engineer may issue a Construction Change Directive on AIA Form G714. The Construction Change Directive instructs the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. The Construction Change Directive contains a complete description of the change in the Work. It also designates the method to be followed to determine change in the Contract Sum or Contract Time. Maintain detailed records on a time and material basis of work required by the Construction Change Directive. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

B. Upon the Owner's approval of a Proposal Request, the Architect will issue a Change Order for signatures of the Owner and the Contractor on AIA Form G701.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

(Not Applicable)

END OF SECTION 010350

SECTION 010400
COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes administrative and supervisory requirements necessary for coordinating construction operations including, but not necessarily limited to, the following:

1. General project coordination procedures.
2. Conservation.
3. Administrative and supervisory personnel.
4. Cleaning and protection.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Project Meetings" for progress meetings, coordination meetings, and preinstallation conferences.
2. Division 1 Section "Submittals" for preparing and submitting the Contractor's Construction Schedule.
3. Division 1 Section "Contract Closeout" for coordinating contract closeout.

1.3 COORDINATION:

A. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in the sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
3. Make provisions to accommodate items scheduled for later installation.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of schedules.

2. Installation and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Project closeout activities.

1.4 SUBMITTALS:

A. Staff Names: Within 15 days of commencement of construction operations, submit a list of the Contractor's principal staff assignments, including the superintendent and other personnel in attendance at the Project Site. Identify individuals and their duties and responsibilities. List their addresses and telephone numbers.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL COORDINATION PROVISIONS:

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

3.2 CLEANING AND PROTECTION:

A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.

B. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period.

C. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

1. Water or ice.
2. Solvents or chemicals.
3. Puncture or abrasion.
4. Soiling, staining, and corrosion.
5. Destructive testing.
6. Misalignment.
7. Unprotected storage.
8. Improper shipping or handling.
9. Theft or Vandalism.

END OF SECTION 010400

SECTION 010450
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes administrative and procedural requirements for cutting and patching.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 2 Section "Selective Demolition" for demolition of selected portions of the building for alterations.
2. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 QUALITY ASSURANCE:

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.

B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safety.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
   a. Primary operational systems and equipment.
   b. Membranes and flashings.
   c. Control systems.
   d. Communication systems.
   e. Electrical wiring systems.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Engineer's opinion, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually unsatisfactory manner.

1. If possible retain the original Installer or fabricator to cut and patch the exposed Work listed below. If it is impossible to engage the original Installer or fabricator, engage another recognized experienced and specialized firm.

1.4 WARRANTY:

A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL:

A. Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible if identical materials are unavailable or cannot be used. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.

1. Before proceeding, meet at the Project Site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.2 PREPARATION:

A. Temporary Support: Provide temporary support of work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Avoid cutting existing pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE:

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original Installer; comply with the original Installer's recommendations.

1. In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

3. Cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill.
4. Comply with requirements of applicable Division 2 Sections where cutting and patching requires excavating and backfilling.
5. Where services are required to be removed, relocated, or abandoned, by-pass utility services, such as pipe or conduit, before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Where removing walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
   a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing the patch after the area has received primer and second coat.

3.4 CLEANING:

A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION 010450

SECTION 012000
PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:

1. Preconstruction conferences.
2. Progress meetings.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Coordination" for procedures for coordinating project meetings with other construction activities.
2. Division 1 Section "Submittals" for submitting the Contractor's Construction Schedule.

1.3 PRECONSTRUCTION CONFERENCE:

A. Schedule a preconstruction conference before starting construction, at a time convenient to the Owner and the Engineer, but no later than 15 days after execution of the Agreement. Hold the conference at the Project Site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

B. Attendees: Authorized representatives of the Owner, Engineer, and their consultants; the Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Discuss items of significance that could affect progress, including the following:

1. Tentative construction schedule, Critical work sequencing.
2. Designation of responsible personnel.
3. Procedures for processing field decisions and Change Orders.
4. Procedures for processing Applications for Payment.
5. Distribution of Contract Documents.
6. Submittal of Shop Drawings, Product Data, and Samples.
7. Preparation of record documents.
8. Use of the premises.
9. Parking availability.
10. Office, work, and storage areas.
11. Equipment deliveries and priorities.
12. Safety procedures, First aid, Security, Housekeeping.
13. Working hours.

1.4 PROGRESS MEETINGS:

A. Conduct weekly progress meetings at the Project Site at regular intervals. Notify the Owner and the Engineer of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.

B. Attendees: In addition to representatives of the Owner and the Engineer, each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.

1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so.
2. Review the present and future needs of each entity present, including the following:
   a. Interface requirements.
   b. Time.
   c. Sequences.
   d. Status of submittals.
   e. Deliveries.
   f. Access.
   g. Site utilization.
   h. Temporary facilities and services.
   i. Hours of work.
   j. Hazards and risks.
   k. Housekeeping.
   l. Quality and work standards.
   m. Change Orders.
   n. Documentation of information for payment requests.

D. Reporting: No later than 2 days after each meeting, distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report. Revise the Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

(Not Applicable)

END OF SECTION 012000

SECTION 013000
SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including the following:

1. Contractor's construction schedule.
2. Submittal schedule.
3. Shop Drawings.
4. Product Data.
5. Samples.
6. Quality assurance submittals.

B. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:

1. Applications for Payment.
2. Performance and payment bonds.
3. Insurance certificates.
4. List of subcontractors.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Coordination" specifies requirements governing preparation and submittal of required Coordination Drawings.
2. Division 1 Section "Project Meetings" specifies requirements for submittal and distribution of meeting and conference minutes.
3. Division 1 Section "Contract Closeout" specifies requirements for submittal of Project Record Documents and warranties at project closeout.

1.3 SUBMITTAL PROCEDURES:

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
    a. The Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.

3. Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for resubmittals.
   a. Allow 2 weeks for initial review. Allow additional time if the Engineer must delay processing to permit coordination with subsequent submittals.
   b. If an intermediate submittal is necessary, process the same as the initial submittal.
   c. Allow 2 weeks for reprocessing each submittal.
   d. No extension of Contract Time will be authorized because of failure to transmit submittals to the Engineer sufficiently in advance of the Work to permit processing.

B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

1. Provide a space approximately 4 by 5 inches on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.
2. Include the following information on the label for processing and recording action taken.
   a. Project name.
   b. Date.
   c. Name and address of the Engineer.
   d. Name and address of the Contractor.
   e. Name and address of the supplier and manufacturer.
   f. Number and title of appropriate Specification Section.
   g. Drawing number and detail references, as appropriate.

C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Engineer using a transmittal form. The Engineer will not accept submittals received from sources other than the Contractor.

1. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.

1.4 CONTRACTOR'S CONSTRUCTION SCHEDULE:

A. Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart-type, contractor's construction schedule. Submit within 30 days after the date established for "Commencement of the Work."

1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values."
2. Within each time bar, indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion.
3. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.
4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically the sequences necessary for completion of related portions of the Work.

5. Coordinate the Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittal Schedule, progress reports, payment requests, and other schedules.
6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Engineer's procedures necessary for certification of Substantial Completion.

B. Phasing: On the schedule, show how requirements for phased completion to permit Work by separate Contractors and partial occupancy by the Owner affect the sequence of Work.

C. Work Stages: Indicate important stages of construction for each major portion of the Work, including submittal review, testing, and installation.

D. Area Separations: Provide a separate time bar to identify each major construction area for each major portion of the Work. Indicate where each element in an area must be sequenced or integrated with other activities.

E. Distribution: Following response to the initial submittal, print and distribute copies to the Engineer, Owner, subcontractors, and other parties required to comply with scheduled dates.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

F. Schedule Updating: Revise the schedule bi-weekly after each meeting, event, or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.5 SUBMITTAL SCHEDULE:

A. After development and acceptance of the Contractor's Construction Schedule, prepare a complete schedule of submittals. Submit the schedule within 10 days of the date required for submittal of the Contractor's Construction Schedule.

1. Coordinate Submittal Schedule with the list of subcontracts, Schedule of Values, and the list of products as well as the Contractor's Construction Schedule.
2. Prepare the schedule in chronological order. Provide the following information:
   a. Scheduled date for the first submittal.
   b. Related Section number.
   c. Submittal category (Shop Drawings, Product Data, or Samples).
   d. Description of the part of the Work covered.
   e. Scheduled date for resubmittal.
   f. Scheduled date for the Engineer's final release or approval.

B. Distribution: Following response to the initial submittal, print and distribute copies to the Engineer, Owner, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the Project meeting room and field office.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

C. Schedule Updating: Revise the schedule after each meeting or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.6 SHOP DRAWINGS:

A. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.

B. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following information:

1. Dimensions.
2. Identification of products and materials included by sheet and detail number.
3. Compliance with specified standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurement.
6. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 24 by 30 inches.
7. Consider omitting the requirement for an initial submittal of Shop Drawings below.
8. Initial Submittal: Submit one correctable, translucent, reproducible print and two blue- or black-line print for the Engineer's review. The Engineer will return the reproducible print.
9. Final Submittal: Submit 3 blue- or black-line prints; submit 5 prints where required for maintenance manuals. The Engineer will retain 2 prints and return the remainder.
10. Do not use Shop Drawings without an appropriate final stamp indicating action taken.

1.7 PRODUCT DATA:

A. Collect product data into a single submittal for each element of construction or system. Product data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following information:
   a. Manufacturer's printed recommendations.
   b. Compliance with trade association standards.
   c. Compliance with recognized testing agency standards.
   d. Application of testing agency labels and seals.
   e. Notation of dimensions verified by field measurement.
   f. Notation of coordination requirements.
2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
3. Preliminary Submittal: Submit a preliminary single copy of Product Data where selection of options is required.
4. Submittals: Submit 3 copies of each required submittal; submit 5 copies where required for maintenance manuals. The Engineer will retain two and will return the other marked with action taken and corrections or modifications required.
   a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
5. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.

a. Do not proceed with installation until a copy of Product Data is in the Installer's possession.
b. Do not permit use of unmarked copies of Product Data in connection with construction.

1.8 ENGINEER'S ACTION:

A. Except for submittals for the record or information, where action and return is required, the Engineer will review each submittal, mark to indicate action taken, and return promptly.

1. Compliance with specified characteristics is the Contractor's responsibility.

B. Action Stamp: The Engineer will stamp each submittal with a uniform, action stamp. The Engineer will mark the stamp appropriately to indicate the action taken, as follows:

1. Final Unrestricted Release: When the Engineer marks a submittal "No Exceptions Taken," the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
2. Final-But-Restricted Release: When the Engineer marks a submittal "Make Corrections Noted," the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.
3. Returned for Resubmittal: When the Engineer marks a submittal "Revise and Resubmit," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark. Do not use, or allow others to use, submittals marked "Revise and Resubmit," at the Project Site or elsewhere where Work is in progress.
4. Subparagraph below is for use where neither approval nor rejection is an appropriate action for Engineer's marking of a submittal.
5. Other Action: Where a submittal is for information or record purposes or special processing or other activity, the Engineer will return the submittal marked "Action Not Required".

C. Unsolicited Submittals: The Engineer will return unsolicited submittals to the sender without action.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

(Not Applicable)

END OF SECTION 013000

SECTION 014210
REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 DEFINITIONS:

A. General: Basic contract definitions are included in the Conditions of the Contract.

B. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on the Drawings; or to other paragraphs or schedules in the Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference. Location is not limited.

C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the Engineer, requested by the Engineert, and similar phrases.

D. "Approved": The term "approved," when used in conjunction with the Engineer's action on the Contractor's submittals, applications, and requests, is limited to the Engineer's duties and responsibilities as stated in the Conditions of the Contract.

E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": The term "furnish" means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": The term "install" describes operations at the Project site including the actual unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.

I. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term "experienced," when used with the term "installer," means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
2. Trades: Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

3. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.
   a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade-union jurisdictional settlements and similar conventions.

J. "Project site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

K. "Architect": Where the term 'Architect' or 'Engineer' appears in the contract documents it shall mean the Engineer of Record, i.e., Design Professional.

L. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION:

A. Specification Content: These Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated as the sense requires. Singular words shall be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Section Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.
   a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.4 INDUSTRY STANDARDS:

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of the date of the Contract Documents.

C. Conflicting Requirements: Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the Engineer for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Engineer for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on the Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source and make them available on request.

E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-producing organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to Gale Research's "Encyclopedia of Associations" or Columbia Books' "National Trade & Professional Associations of the U.S.," which are available in most libraries.

1.5 SUBMITTALS:

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

(Not Applicable)

END OF SECTION 014210

SECTION 015000
CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes requirements for construction facilities and temporary controls, including temporary utilities, support facilities, and security and protection.

B. Temporary utilities include, but are not limited to, the following:

1. Temporary electric power and light.
2. Temporary heat.
3. Telephone service.
4. Sanitary facilities, including drinking water.

C. Support facilities include, but are not limited to, the following:

1. Field offices and storage sheds.
2. Temporary enclosures.
3. Temporary project identification signs and bulletin boards.
4. Waste disposal services.
5. Rodent and pest control.
6. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities include, but are not limited to, the following:

1. Temporary fire protection.
2. Barricades, warning signs, and lights.
3. Enclosure fence for the site.
4. Environmental protection.

1.3 QUALITY ASSURANCE:

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:

1. Building code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, fire department, and rescue squad rules.
5. Environmental protection regulations.

B. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities." Comply

with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electrical Code."

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.4 PROJECT CONDITIONS:

A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of permanent service.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

PART 2 - PRODUCTS

2.1 EQUIPMENT:

A. General: Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.

B. Water Hoses: Provide 3/4-inch, heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.

C. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-Volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.

D. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixtures where exposed to moisture.

F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.

G. Temporary Offices: Provide prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows, and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.

H. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of the chemical, aerated recirculation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material. Use of Owner's existing toilets will not be permitted.

I. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION:

A. General: Engage the appropriate local utility company to install temporary service or connect to existing service as indicated. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.

1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Architect unless noted otherwise. Neither the Owner nor Engineer will accept cost or use charges as a basis of claims for Change Orders.

B. Water Service: Install water service and distribution piping of sizes and pressures adequate for construction from Owner's sources on-site.

C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period connected to local electric utility company grid. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switch gear.

1. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, ac 20 Ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.

D. Temporary Heat: Provide temporary heat required by construction activities for curing or drying of completed installations or for protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.

E. Heating Facilities: Except where the Owner authorizes use of the permanent system, provide vented, self-contained, LP-gas or fuel-oil heaters with individual space thermostatic control. Use of gasoline-burning space heaters, open flame, or salamander heating units is prohibited.

F. Temporary Telephones: Provide temporary telephone service throughout the construction period for all personnel engaged in construction activities, as well as computer Internet connection. Install telephone on a separate line for each temporary office and first-aid station.

G. Sanitary facilities include temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide covered waste containers for used material. Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.

3.3 SUPPORT FACILITIES INSTALLATION:

A. Locate field offices, storage sheds, and other temporary construction and support facilities for easy access. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

B. Field Offices: Provide insulated, weathertight temporary offices of sufficient size to accommodate required office personnel at the Project Site but not less than 150 SF. Keep the office clean and orderly for use for small progress meetings. Furnish with a desk and chairs, a 4-drawer file cabinet, plan table, plan rack, and a 6-shelf bookcase, temporary telephones, fax, and computer (Pentium class processor with Internet connection, email service, and printer).

C. Storage and Fabrication Sheds: Install storage and fabrication sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere on-site.

D. Temporary Enclosures: Provide temporary enclosures for protection of the buildings, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.

1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 sq. ft. or less with plywood or similar materials.
3. Close openings through floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
4. Where temporary wood or plywood enclosure exceeds 100 sq. ft. in area, use UL-labeled, fire-retardant-treated material for framing and main sheathing.

E. Project Identification and Temporary Signs: Prepare project identification and other signs of size indicated. Install signs where indicated to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative-treated wood or steel. Do not permit installation of unauthorized signs.

1. Project Identification Signs: Engage an experienced sign painter to apply graphics. Indicate the following minimum information:
   a. Project Name.
   b. Owner.
   c. Engineer.
   d. Contractor.

2. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.

F. Rodent and Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Employ this service to perform extermination and control procedures at regular intervals so the Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION:

A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the Engineer.

B. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations."

1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

C. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.

D. Enclosure Fence: Before excavation begins, install an enclosure fence with lockable entrance gates around complete construction site. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.

1. Provide open-mesh, chainlink fencing with posts set in a compacted mixture of gravel and earth.

E. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

F. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result.

3.5 OPERATION, TERMINATION, AND REMOVAL:

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Termination and Removal: Unless the Engineer requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.
2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at the temporary entrances, as required by the Owner and governing authority.

3.6 PARKING SPACES AND MATERIAL STORAGE:

A. Owner shall designate sufficient parking space for Contractor's use based on needed parking usage. Contractor is directed to limit number of vehicles parked on the site to only allocated spaces.

B. Contractor shall be limited to the designated construction limits or as defined by the University for lay-down, material delivery and storage of materials.

END OF SECTION 015000

SECTION 016310
SUBSTITUTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes administrative and procedural requirements for handling requests for substitutions made after award of the Contract.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Reference Standards" specifies the applicability of industry standards to products specified.
2. Division 1 Section "Submittals" specifies requirements for submitting the Contractor's Construction Schedule and the Submittal Schedule.

1.3 DEFINITIONS:

A. Definitions in this Article do not change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Contractor after award of the Contract are considered to be requests for substitutions. The following are not considered to be requests for substitutions:

1. Substitutions requested during the bidding period, and accepted by Addendum prior to award of the Contract, are included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
2. Revisions to the Contract Documents requested by the Owner or Architect.
3. Specified options of products and construction methods included in the Contract Documents.
4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS:

A. Conditions: The Engineer will receive and consider the Contractor's request for substitution when one or more of the following conditions are satisfied, as determined by the Engineer. If the following conditions are not satisfied, the Engineer will return the requests without action except to record noncompliance with these requirements.

1. The specified product or method of construction cannot be provided within the Contract Time. The Engineer will not consider the request if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.

2. The requested substitution offers the Owner a substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities the Owner must assume. The Owner's additional responsibilities may include compensation to the Engineer for redesign and evaluation services, increased cost of other construction by the Owner, and similar considerations.
3. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
4. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.

B. The Contractor's submittal and the Engineer's acceptance of Shop Drawings, Product Data, or Samples for construction activities not complying with the Contract Documents do not constitute an acceptable or valid request for substitution, nor do they constitute approval.

PART 3 - EXECUTION

(Not Applicable)

END OF SECTION 016310

SECTION 017000
CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Divisions 1, 23 and 26 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes administrative and procedural requirements for contract closeout including, but not limited to, the following:

1. Inspection procedures.
2. Project record document submittal.
3. Operation and maintenance manual submittal.
4. Submittal of warranties.
5. Final cleaning.

B. Closeout requirements for specific construction activities are included in other specification sections.

1.3 SUBSTANTIAL COMPLETION:

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.

1. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
2. Submit record drawings, maintenance manuals and similar final record information.
3. Deliver tools, spare parts, extra stock, and similar items.
4. Make final changeover of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of changeover in security provisions.
5. Complete startup testing of systems and instruction of the Owner's operation and maintenance personnel. Discontinue and remove temporary facilities from the site, along with mockups, construction tools, and similar elements.
6. Complete final cleanup requirements, including touchup painting.
7. Touch up and otherwise repair and restore marred, exposed finishes.

B. Inspection Procedures: On receipt of a request for inspection, the Owner’s Representative will either proceed with inspection or advise the Contractor of unfilled requirements. The Owner’s Representative will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The Owner’s Representative will repeat inspection when requested and assured that the Work is substantially complete.
2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 FINAL ACCEPTANCE:

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit a certified copy of the Owner's Representative's final inspection list of items to be completed or corrected, endorsed and dated by the Owner's Representative. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by the Owner's Representative.
4. Submit consent of surety to final payment.
5. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Reinspection Procedure: The Owner's Representative will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to the Owner's Representative.

1. Upon completion of reinspection, the Owner's Representative will prepare a certificate of final acceptance. If the Work is incomplete, the Owner's Representative will advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance. If necessary, reinspection will be repeated.

1.5 RECORD DOCUMENT SUBMITTALS:

A. General: Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documents for the Owner's Representative's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.
2. Note related change-order numbers where applicable.
3. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.

C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda. Include with the Project Manual one copy of other written construction documents, such as Change Orders and modifications issued in printed form during construction.

1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.

2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
3. Note related record drawing information and Product Data.
4. Upon completion of the Work, submit record Specifications to the Owner's Representative for the Owner's records.

D. Maintenance Manuals: Organize operation and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-inch, 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:

1. Emergency instructions.
2. Spare parts list.
3. Copies of warranties.
4. Wiring diagrams.
5. Recommended "turn-around" cycles.
6. Inspection procedures.
7. Shop Drawings and Product Data.
8. Fixture lamping schedule.
9. Directory of local vendors for maintenance supplies such as lamps, filters, etc.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES:

A. Operation and Maintenance Instructions: Arrange for each Installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:

1. Modify list below to suit Project.
2. Maintenance manuals.
3. Record documents.
4. Spare parts and materials.
5. Tools.
6. Lubricants.
7. Fuels.
8. Identification systems.
9. Control sequences.
10. Hazards.
11. Cleaning.
12. Warranties and bonds.
13. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating equipment, demonstrate the following procedures:

1. Startup.
2. Shutdown.
3. Emergency operations.

4. Safety procedures.
5. Economy and efficiency adjustments.

3.2 FINAL CLEANING:

A. General: The General Conditions require general cleaning during construction. Regular site cleaning is included in Division 1 Section "Construction Facilities and Temporary Controls."

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion.
   a. Remove labels that are not permanent labels.
   b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
   c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
   d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
   e. Clean the site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests.

D. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of lawfully.

END OF SECTION 017000

SECTION 017400
WARRANTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1, 23 and 26 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturer's standard warranties on products and special warranties. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Contract Closeout" specifies contract closeout procedures.
2. Divisions 2 through 26 Sections for specific requirements for warranties on products and installations specified to be warranted.
3. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 DEFINITIONS:

A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.4 WARRANTY REQUIREMENTS:

A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

D. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such

other duties, obligations, rights, or remedies. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

E. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.5 SUBMITTALS:

A. Submit written warranties to the Engineer prior to the date certified for Substantial Completion. If the Engineer's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Engineer. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Engineer within 15 days of completion of that designated portion of the Work.

B. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Engineer, for approval prior to final execution.

C. Forms for special warranties are included at the end of this Section. Prepare a written document utilizing the appropriate form, ready for execution by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Submit a draft to the Owner, through the Architect, for approval prior to final execution. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

D. Form of Submittal: At Final Completion compile 2 copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

E. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
3. Provide additional copies of each required warranty, as necessary, for inclusion in each required Operations and Maintenance manual.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 – EXECUTION

(Not Applicable)

END OF SECTION 017400

SECTION 020700
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following:

1. Demolition and removal of selected portions of a building.
2. Patching and repairs.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Cutting and Patching" for cutting and patching procedures for selective demolition operations.
2. Division 1 Section "Construction Facilities and Temporary Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and environmental protection measures for selective demolition operations.
3. Division 1 Section "Contract Closeout" for record document requirements.

1.3 DEFINITIONS:

A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.

B. When salvage is required, indicate or describe Owner's designated storage area, on-site or off-site.

C. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.

D. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.

E. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Engineer, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.4 MATERIALS OWNERSHIP:

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

B. Historical items, relics, and similar objects and other items of interest or value to the Owner, which may be encountered during selective demolition, remain the Owner's property. Carefully

remove and salvage each item or object in a manner to prevent damage and deliver promptly to the Owner.

1.5 SUBMITTALS:

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections, for information only, unless otherwise indicated.

B. Proposed dust-control measures.

C. Proposed noise-control measures.

D. One use of the schedule below is to track Contractor's progress. Another use is to determine that selective demolition will not interfere with Owner's operations. Delete schedule submittal if not required or if selective demolition will not interfere with Owner's operations.

E. Schedule of selective demolition activities indicating the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
2. Interruption of utility services.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Detailed sequence of selective demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
7. Locations of temporary partitions and means of egress.

F. Inventory of items to be removed and salvaged.

G. Landfill records indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes, if required.

1.6 QUALITY ASSURANCE:

A. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.7 PROJECT CONDITIONS:

A. Owner will occupy portions of the building immediately adjacent to selective demolition area. Conduct selective demolition so that Owner's operations will not be disrupted. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

B. Owner assumes no responsibility for actual condition of buildings to be selectively demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Asbestos: It is not expected that asbestos will be encountered in the Work. If any materials suspected of containing asbestos are encountered, do not disturb the materials. Immediately notify the Engineer and the Owner.

D. Storage or sale of removed items or materials on-site will not be permitted.

1.8 SCHEDULING:

A. Arrange selective demolition schedule so as not to interfere with Owner's on-site operations.

1.9 WARRANTY:

A. Existing Special Warranty: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS:

A. Use repair materials identical to existing materials.

1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
2. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Engineer.

E. Survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.

F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES:

A. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.

a. Provide not less than 2 weeks notice to Owner if shutdown of service is requested.

3.3 PREPARATION:

A. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

B. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective demolition area.

1. Erect temporary protection, such as walks and fences where required by authorities having jurisdiction.
2. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.
3. Cover and protect furniture, furnishings, and equipment that have not been removed.

3.4 POLLUTION CONTROLS:

A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.

C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.5 SELECTIVE DEMOLITION:

A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Do not use cutting torches.
4. Locate selective demolition equipment throughout the structure and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
5. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.

6. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.

3.6 PATCHING AND REPAIRS:

A. Promptly patch and repair holes and damaged surfaces caused to adjacent construction by selective demolition operations.

B. Patching is specified in Division 1 Section "Cutting and Patching."

C. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

D. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.

E. Patch and repair wall surfaces in the new space where demolished walls or partitions extend one finished area into another. Provide a flush and even surface of uniform color and appearance.

1. Closely match texture and finish of existing adjacent surface.
2. Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
3. Where patching smooth painted surfaces, extend final paint coat over entire unbroken surface containing the patch after the surface has received primer and second coat.
4. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
5. Inspect and test patched areas to demonstrate integrity of the installation, where feasible.

F. Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.7 DISPOSAL OF DEMOLISHED MATERIALS:

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.8 CLEANING:

A. Sweep buildings broom clean on completion of selective demolition operation.

END OF SECTION 020700

SECTION 220000
PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 230000, Mechanical General, apply to all work specified in this section.

1.2 DESCRIPTION:

A. Include all necessary apparatus, excavating, controls, valves and fittings required for a complete sanitary plumbing system.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS:

A. Domestic cold water piping: Hard Copper Tube: ASTM B88, Type "L", water tube, Hard drawn temper, with soldered joints and wrought copper socket fittings.

B. Fittings: Wrought copper, solder-joint pressure fittings, ASME B16.22. Provide reducing fittings to reduce pipe size. Bushings will not be acceptable.

C. Joints: Solder joints in Type L copper tubing: Wire solder, 95/5 lead free, in accordance with manufacturer's recommendations.

2.2 VALVES AND SPECIALTY ITEMS:

A. Refer to Section 230523, Valves, for requirements.

2.3 HANGERS AND SUPPORTS:

A. Refer to Section 230529, Pipe Hangers and Supports, for requirements.

2.4 PIPING INSULATION:

A. Refer to Section 230700, Thermal Insulation for Mechanical Systems, for requirements.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Remove stems and washers from solder end valves and other item subject to damage by heat during installation and reassemble valve after soldering.

B. Provide dielectric union connectors at all connections between non-ferrous and ferrous metal piping materials.

C. Pipe openings shall be closed with caps or plugs during installation. Tightly cover fixtures and equipment and protect against dirt, water, chemicals and mechanical injury. Upon completion of the work, thoroughly clean, adjust and operate the fixtures, materials and equipment.

D. Cut pipe accurately and work into place without springing or forcing. Run above ground piping parallel with the lines of the building unless otherwise indicated. Do not bury water pipe in or under floors unless specifically indicated on the drawings. Make changes in pipe sizes with reducing fittings. Use of bushings will not be acceptable, make changes in direction with fittings.

3.2 TESTS:

A. Test domestic cold water piping for a continuous period of not less than four hours at a hydrostatic pressure of not less than 125 psig and make free from leaks. Completely remake leaky joints with piping dry. Retest system after leaks are corrected.

END OF SECTION 220000

SECTION 220570
TRENCH EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 23 0000, Mechanical General, apply to all work specified in this section.

1.02 DESCRIPTION:

A. All work associated with the installation of underground piping shall conform to the requirements of this section including but not necessarily limited to:

1. Trench excavation.
2. Sheeting and/or shoring.
3. Dewatering.
4. Pipe installation.
5. Backfill.
6. Compaction.

1.03 QUALITY ASSURANCE:

A. Work shall be performed by qualified firms having at least three years of successful trench excavation and backfill experience.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Granular bedding and select backfill materials shall be durable gravel, crushed stone or bankrun gravel meeting the graduation requirements of the State Department of Transportation Specifications.

B. Common Backfill:

1. Common backfill shall consist of mineral soil free of organic material, loam, wood, trash, snow, ice, frozen soil and other objectionable material which may be compressible or which cannot be compacted properly. Common backfill shall not contain stones larger 2 inches in any dimension, nor broken concrete, masonry, rubble or other similar materials. It shall have physical properties such that it can be readily deposited and compacted during backfilling.
2. Common backfill material falling within the above specifications and encountered during the excavation may be stored in segregated stockpiles for re-use. All materials which, in the opinion of the **Architect**, is not suitable for re-use shall be disposed of as specified herein for disposal of unsuitable materials.

PART 3 - EXECUTION

3.01 COORDINATION:

A. The work covered by this section is defined to include whatever excavating and backfilling is necessary to install the underground mechanical work. Coordinate the work with other excavating and backfilling operations in the same area, including dewatering and other temporary facilities. Coordinate the work with other work in the same area including other underground services (whether existing or new), landscape development, paving, foundations and floor slabs on grade. Coordinate

with anticipated weather conditions and provide temporary facilities needed for protection and proper performance of excavating and backfilling operations.

3.02 DISPOSAL OF MATERIALS:

A. Stack excavated material without excessive surcharge near the trench bank. Avoid inconvenience to traffic as much as possible. Segregate excavated material for use in backfilling as specified below.

B. Stockpile surplus excavated material which is suitable for use in backfilling. Dispose of unsatisfactory surplus material.

C. Remove no excavated material from the site or disposed of except as directed by the **Architect**.

D. Should conditions make it impracticable or unsafe to stack material adjacent to the trench, haul and store the material. When required, rehandle it and use in backfilling the trench. Perform this at no additional cost to the Contract.

3.03 SHEETING AND BRACING:

A. Furnish, put in place and maintain sheeting and bracing required to support the sides of the excavation and prevent loss of ground which could damage or delay the work or endanger adjacent structures. Take care to prevent voids outside of the sheeting, however if voids are formed, they shall be immediately filled and rammed.

3.04 DRAINAGE:

A. Furnish all materials and equipment and perform all incidental work required to install and maintain the drainage system that is proposed for handling ground water or surface water encountered. Do not begin construction until the **Architect** is assured that the proposed method will be satisfactory. Excavations shall have a stable subgrade. Alter the drainage methods if, in the opinion of the **Architect**, the trench bottom is unsatisfactory.

B. Provide pumping equipment and devices to properly remove and dispose of all water entering the trench and excavation for structures. Maintain the grade acceptably dry until structures to be built therein are completed. Perform all drainage without damage to the trench, pavements, pipes or other utilities. Dispose of water in a manner acceptable to the **Architect** and to the local authority having jurisdiction.

C. Grade the tops of trenches as required to prevent surface water from flowing into the trenches.

D. Do not lay pipes in water nor allow them to become submerged prior to backfilling.

3.05 TRENCH EXCAVATION:

A. Make excavations to the depth as required by the drawings and in such a manner and to such minimum widths as will provide suitable room for laying the pipe within the trench, for bracing and shoring, and for pumping and drainage facilities, and render the bottoms of the excavations firm and dry at all times.

B. The sides of the trenches shall be vertical to a point not less than 12 inches above the top of the pipe.

C. The trenches may be excavated by machinery to, or just below the designated subgrade provided that the material remaining in the bottom of the trench is no more than slightly disturbed.

D. Where the pipes are to be laid directly on the trench bottom, do not excavate the lower part of the trench to grade by machinery. Excavate the last of the material to be excavated manually and do so in such a manner that it will provide a flat bottom and true to grade, so that the pipe can be evenly supported on undisturbed material. Make bell holes as required to accommodate the installation of the pipe.

E. Where bedding material is to be provided, excavate the bottom of the trench to a depth of 4 inches below the bottom of the pipe for the bedding material.

F. Remove rock, when encountered, to a minimum of 8 inches clearance around the bottom and sides of the pipe being laid.

3.06 PIPE BEDDING:

A. Furnish and install pipe on the type of bedding indicated on the drawings and as specified herein. Regardless of the type of bedding used, provide holes in the trench to receive the pipe bells. The holes excavated shall be sufficient to relieve the pipe bells of all loads and to provide support over the total length of the pipe barrel. Carefully prepare the bedding so that the pipe, after installation, will be true to line and grade.

B. Pipe Bedding Classifications:

1. Class D-1 Bedding. For Class D-1 bedding, hand shape the trench bottom to provide holes to receive the pipe bells. The holes excavated shall be sufficient to relieve the pipe bells of all loads and shall permit the trench bottom to provide support along the entire length of the pipe barrel. Grade the bottom of the trench so that the pipe will be true to line and grade. Class D-1 pipe bedding may be used for pressure piping only.
2. Class C-1 Bedding. For Class C-1 bedding, compact granular bedding material in the trench bottom to provide a minimum thickness of 4 inches below the bottom of the pipe. Then shape the bedding material by hand to the contour of the pipe barrel. Provide bell holes for the pipe bells to ensure that loads are not transmitted to the pipe bells. Use sufficient bedd roing material to provide a depth of 1/6 of the pipe outside diameter. Where the trench bottom has been over-excavated below the required grade, Class C-1 bedding shall be used.
3. Class C-2 Bedding. For Class C-2 bedding, the bottom of the trench shall be undisturbed and shall be hand shaped to provide continuous contoured support along the entire length of the pipe, for a minimum of 50% of the pipe barrel. Provide bell holes at all pipe bells to ensure that loads are not transmitted to the pipe bells.
4. Class B-1 Bedding. For Class B-1 bedding, compact granular bedding material in the trench bottom to provide a minimum thickness of 4 inches below the bottom of the pipe. Then shape the bedding material by hand to the contour of the pipe barrel. Provide bell holes for the pipe bells to ensure that no loads are transmitted to the pipe bells. Use sufficient bedding material to provide a depth of material equal to the springline of the pipe. Where rock has been excavated from the trench bottom, Class B-1 bedding shall be used, and a minimum bedding thickness of 8 inches shall be provided.
5. Class B-2 Bedding. For Class B-2 bedding, utilize sand as the bedding material, compacted in the trench bottom to provide a minimum thickness of 4 inches below the bottom of the pipe. Then shape the bedding material by hand to the contour of the pipe barrel. Provide bell holes for the pipe bells to ensure that no loads are transmitted to the pipe bells. Use sufficient bedding material to provide a depth of material 12 inches above the top of the pipe.
6. Class A-1 Bedding. For Class A-1 bedding, compact granular bedding material in the trench bottom to provide a minimum thickness of 4 inches below the bottom of the pipe. Then shape the bedding material by hand to the contour of the pipe barrel. Provide bell holes for the pipe bells to ensure that no loads are transmitted to the pipe bells. Use sufficient bedding material to provide a depth of material equal to the springline of the pipe. After the bedding

material has been compacted to the springline of the pipe, pour a lean concrete mix, 2000 psi minimum, the full width of the trench, to a depth of 6 inches above the top of the pipe. Concrete shall be cured and protected from injury due to construction and weather prior to subsequent backfilling operations.

C. As soon as possible after the pipe has been brought to grade, aligned and jointed, shovel additional bedding or backfill material, depending upon the class of bedding, uniformly and simultaneously on each side of the pipe up to the pipe centerline. Thoroughly hand tamp on both sides and under the pipe. Maintain the pipe in proper position and alignment during subsequent pipe jointing, embedment and backfilling operations.

3.07 PIPE INSTALLATION:

A. Lay all piping accurately to line and grade by the use of lasers, batter boards (spaced not more than 25 feet apart), or plumb lines. Have three consecutive batter boards in place at all times when installing the pipe. When necessary, deflect the pipe at the joints. Deflection shall not exceed the manufacturer's recommendations.

B. Prior to making joints, clean and dry all surfaces of the pipe joint and jointing materials. Use lubricants, primer and adhesives as recommended by the pipe or joint manufacturer. Then make joints in an approved workmanlike manner to obtain a water-tight joint. Keep trenches free of water during bedding, pipe laying, jointing and backfilling.

3.08 BACKFILLING:

A. As soon as practicable after the pipe has been laid, jointed and tested, begin backfilling and expedite completion.

B. After the required bedding has been placed, or after the pipe has been properly bedded on a shaped trench bottom, place backfill material, free from stones and other foreign material to a depth of 12 inches over the top of the pipe. Place backfill in 12 inch lifts and thoroughly compact by hand tamping as placed.

C. Pack full any remaining spaces or voids between the pipe and the sides of the trench by hand shovel with selected earth, free from stones having a diameter greater than 2 inches, and thoroughly compact with a tamper, as placed up to a level of 12 inches above the top of the pipe.

D. Carry the backfilling up evenly on both sides of the pipe with continuous tamping.

E. Place backfill in 8 inch to 12 inch lifts to obtain the compaction desired.

F. Fill and thoroughly compact the remainder of the trench above the compacted backfill by rolling or tamping. All trench compaction shall be at least 95% of its maximum dry density as determined by the Standard Proctor Test, ASTM D-698.

3.09 RESTORATION OF DISTURBED SURFACES:

A. Where it is necessary to remove and replace landscape work, pavement, sidewalks, flooring and similar exposed finished work, engage the original installer to install the replacement work, except where the work existed prior to the work of this contract. In this instance, engage only experienced and expert firms and tradespersons to replace the work.

3.10 CLEANUP:

A. Promptly remove all discarded or unused materials, trash and debris and dispose of it off the Owner's property. Dispose of excess excavated material as directed by the **Architect**.

END OF SECTION 220570

SECTION 230000
MECHANICAL GENERAL

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This division and the accompanying drawings cover furnishing of all labor, equipment, appliances and materials and performing all operations in connection with the installation of complete air conditioning, ventilating, heating, plumbing and fire protection systems as specified herein and as shown on the drawings.

B. The general provisions of the Contract including the conditions of the Contract (General, Supplementary and other Conditions) and other divisions as appropriate, apply to all work specified in this division.

1.2 CODES AND REGULATIONS:

A. Comply with the following codes and standards as applicable, including all Georgia amendments, for all heating, ventilating and air conditioning materials and workmanship:

1. The International Energy Conservation Code, 2009 Edition.
2. The International Mechanical Code, 2006 Edition.
3. The National Electrical Code, 2011 Edition.

B. Comply with the following codes and standards as applicable, including all Georgia amendments, for all plumbing materials and workmanship:

1. The International Plumbing Code, 2006 Edition.

C. The publications listed below form a part of this specification to the extent referenced and are referred to in the text by the basic designation only.

1. Air-Conditioning and Refrigeration Institute Standards (ARI).
2. American National Standards Institute, Inc. Standards (ANSI).
3. American Society for Testing and Materials Publications (ASTM).
4. American Society of Mechanical Engineers Code (ASME).
5. National Fire Protection Association Standards (NFPA).
6. Underwriters Laboratories, Inc. (UL).

D. Comply with all state and local codes having jurisdiction. Make all modifications required by these codes without additional charges. Immediately bring to the attention of the Engineer any conflict between these documents and the governing codes. Follow the drawings and specifications where code requirements are less stringent than those shown on the drawings or in the specifications.

E. Obtain all permits, inspections and approvals as required by all authorities having jurisdiction and deliver certificates of approval to the Engineer. Assume and pay all fees and costs of any nature whatsoever incidental to these permits.

F. Comply with all applicable provisions of the William-Steiger Occupational Safety and Health Act (OSHA).

PART 2 - PRODUCTS

2.1 COORDINATION:

A. The products of particular manufacturers have been used as the basis of design in preparation of these documents. Coordinate with all other trades any modifications to the mechanical systems and their components, the electrical systems, the building structure and architecture or any other portion of the building that result from the use of any other than the basis of design equipment.

B. Such coordination shall occur before delivery of products from the manufacturer and shall be clearly indicated on the shop drawings. Perform all related modifications without any additional cost to the Contract.

2.2 DESCRIPTION:

A. All products shall be new and shall bear the Underwriter's Laboratories, Inc. (UL) label unless specifically indicated otherwise.

PART 3 - EXECUTION

3.1 GENERAL:

A. The mechanical drawings do not give exact elevations or location of lines, nor do they show all the offsets, control lines or installation details. Carefully lay out the work at the site to conform to the structural conditions, to provide proper grading of lines, to avoid all obstructions, to conform to details of the installation supplied by the manufacturers of the equipment to be installed, and to thereby provide an integrated and coordinated installation operating at optimum performance.

B. If equipment and piping requires space conditions other than those shown, or if the equipment is rearranged, assume full responsibility for the rearrangement of the space and have the Engineer review the change before proceeding with the work. Perform all related costs incurred without any additional cost to the Contract.

C. Properly locate and size of all slots and openings in the building structure pertaining to the work and correctly locate sleeves, inserts and cores.

D. Coordinate the work of several various trades so that it may be installed in the most direct and workmanlike manner without hindering or handicapping the other trades. Handle piping interferences by giving precedence to pipe lines which require a stated grade for proper operation.

E. Do not run piping or locate equipment with respect to switchboards, panelboards, power panels, motor control centers or dry type transformers:

1. Within 42" in front (and rear if free standing) of electrical equipment.
2. Within 36" of sides of electrical equipment.
3. Clearances apply vertically from floor to structure.

G. Provide access to equipment and apparatus requiring operation, service or maintenance within the life of the system.

3.2 ELECTRICAL WORK:

A. Comply with the electrical system characteristics indicated on the electrical drawings and specified in Division 26 all electrical equipment provided under this Division.

B. All components shall be in conformance with the requirements of the National Electrical Code and Division 26. Furnish motor starters for all equipment under Section 230513, Starters and Disconnect Switches, unless specifically indicated to be furnished under Division 26.

C. Provide all power wiring and final power connections to the systems under Division 26.

D. Provide control wiring (120 volt and less) under Division 23 and extend from the 120 volt power circuits indicated on the electrical drawings. All wiring for voltages higher than 30 volts shall be done by a licensed electrician.

E. Take all electrical characteristics from the electrical drawings and coordinate with the electrical drawings before equipment is ordered or shop drawings submitted.

F. Electrical power wiring to HVAC control panels may not be indicated on the drawings. Determine final control panel locations and quantity prior to bidding and include 115 volt power circuits to each control panel location.

3.3 MOTORS:

A. Unless specifically noted otherwise in other sections of these specifications, all motors and motor controllers shall meet the requirements specified in this Section. All motors shall be built in accordance with the current applicable IEEE and NEMA standards and shall have voltage, phase, frequency and service as scheduled.

B. Each motor shall be of the high efficiency type, Century E-Plus or equal. They shall be suitable for the brake horsepower of the driven unit, rated with 1.15 minimum service factor, and shall be NEMA design B. The motor temperature rise shall not exceed 40 degrees C for drip proof motors, 50 degrees C for splash-proof motors and 55 degrees C for totally enclosed motors. The motors shall be capable of operating continuously at such temperatures and shall be capable of withstanding momentary overloads of 25 percent without injurious overheating.

C. Motors shall be ball bearing type selected for quiet operation and shall be manufactured for general purpose duty unless otherwise indicated. Each bearing shall be accessible for lubrication and designed for the load imposed by the V-belt drive or the driven apparatus. Direct drive motors shall be designed for the specific application with all necessary thrust bearings and shaft capacities.

D. Motors larger than 1/2 horsepower shall have bearings with pressure grease lubrication fittings.

E. Each motor to be installed outdoors shall be of the totally enclosed fan-cooled type or housed in a weatherproof housing.

F. Unless otherwise indicated, motors smaller than 1/2 horsepower shall be capacitor start or split phase type designed for 120 volt, single phase, 60 cycle alternating current. Shaded pole motors will not be acceptable except 35 watts and smaller. Motors 1/2 horsepower and larger shall be squirrel cage induction type, 3 phase, 60 cycle alternating current.

G. Motors controlled by variable frequency speed controllers shall, except as noted, be consequent pole, variable torque, single winding. When the speed ratios or the load characteristics dictate, variable speed motors operating over an adjustable range of speeds shall be motors specifically designed and rated for this duty, shall have Class F insulation or better and shall have a minimum 1.15 service factor.

H. If motors are furnished varying in horsepower and/or characteristics from those specified, first inform the Engineer of the change by clearly identifying it on the shop drawings or submittal, and then coordinate the change with all associated parties. Bear all additional charges in connection with the change.

3.4 PROTECTION OF EQUIPMENT:

A. Store all equipment, including pipe and valves, off the ground and under cover. For storage outdoors, securely fit minimum 4 mil thick plastic to withstand splattering, ground water, precipitation and wind.

B. Plug ends of pipe when work is stopped with 4 mil thick plastic taped in place until work resumes. Duct tape is not an acceptable substitute.

C. Repair or replace damaged equipment at the option of the Engineer.

3.5 PAINTING:

A. Repaint factory painted equipment that has been scratched or marred to match original factory color.

B. Clean and paint all un-insulated black ferrous metal items exposed to sight inside the building such as un-insulated piping, equipment hangers and supports with one coat of zinc chromate primer. In addition, paint such items in the mechanical rooms with two coats of finish paint in a color to match adjacent surfaces or as otherwise directed by the Engineer.

C. Clean and paint black ferrous metal items exposed outside the building such as un-insulated pipe and pipe supports with one coat of rust inhibiting primer and two coats of an asphaltic base aluminum paint. Clean and paint all piping installed outside the building that is to be insulated with one coat of rust inhibiting primer before installing insulation.

D. In lieu of painting hanger rods, cadmium plated or galvanized steel rods may be furnished.

E. Do not paint nameplates on equipment and afford suitable protection to the plates to prevent their being rendered illegible during the painting operation.

3.6 PROTECTION OF EXISTING UTILITIES:

A. Use extreme caution during excavation operations not to damage or otherwise interrupt the operations of existing utilities. Be responsible for the continuous operation of these lines and provide bypasses or install such shoring, bracing or underpinning as may be required for proper protection.

B. Schedule work so existing systems will not be interrupted when they are required for normal usage of the buildings. Inform the Owner's representative and Engineer and obtain approval from the utility authority involved at least seven days prior to any utility interruption or connection.

C. Coordinate all activities around existing utility lines with the appropriate utility company.

3.7 CUTTING AND PATCHING:

A. Refer to Section 011450, Cutting and Patching.

B. Assume all cost of, and be responsible for, all cutting and patching required to complete the installation of the work. All cutting shall be carefully and neatly done so as not to damage or cut away more than is necessary of any portions of the structure.

C. Reinstate all surfaces to the condition of the adjacent surfaces.

D. Make suitable provisions for adequately water-proofing at the penetrations of exterior walls, floors and roofs.

3.8 SLEEVES AND FRAMES:

A. Install in concrete, carpentry or masonry construction, all necessary sleeves, hangers, expansion bolts, inserts and other fixtures and appurtenances necessary for the support of all pipe, equipment and devices furnished under this Division.

B. Cut openings and install sleeves through walls and surfaces in a neat workmanlike manner. Cut openings only as large as required for the installation. Install sleeves flush with finished surfaces and grout in place unless otherwise indicated. Leave surfaces around openings smooth and finish to match surrounding surface.

C. Where pipes pass through walls, sleeves shall be standard weight black steel pipe or 20-gauge galvanized sheet metal with ends flush with both surfaces.

D. Provide each pipe passing through walls with sleeves having an internal diameter 1 inch larger that the outside dimensions of the insulated pipe.

E. Pack all penetrations through rated walls with mineral wool and cap off with a silicon caulk. As a alternate use an approved, fire rated sealant as manufactured by Hilti, 3M or Dow. Materials shall meet or exceed UL 1479 or ASTM E814 requirements.

F. Sleeves through exterior walls shall be steel pipe, flush with both wall surfaces, and with the space between the pipe and the sleeve caulked watertight in an approved manner.

G. Inserts shall be individual type galvanized steel with accommodations for removable nuts and threaded rods up to 3/4 inch diameter and permitting lateral adjustment.

3.9 CLEANING:

A. Flush new water piping systems until water runs clean. Mild chemical cleaning may be required. If so, flush all cleaning chemicals out of the piping system before recharging with water.

B. Remove all stickers, rust, stains, labels and temporary covers before final acceptance.

C. Clean the exterior surfaces of all mechanical equipment, piping and accessories of all grease, oil, paint, dust and other construction debris.

D. Lubricate bearings that require lubrication in accordance with the manufacturer's recommendations. Provide two copies of certification of lubrication.

E. Leave mechanical rooms broom clean.

F. Provide temporary filters for any fans operated during construction. Change temporary filters regularly to prevent contamination of the equipment and duct systems. Install new and unused permanent filters one week prior to final inspection.

G. Cover ends of open pipes during construction except when working on such end prohibits covering. Cover with minimum 4 mil thick polyethylene taped, tied or wired in place.

H. Clean and polish identification plates.

3.10 EQUIPMENT, MATERIALS AND BID BASIS:

A. Refer to Section 016310, Substitutions.

B. It is the intent of these Specifications to indicate a standard of quality for all materials incorporated into the work. Manufacturer's names are used to designate the item of equipment or material as a means of establishing grade and quality.

C. Substituted manufacturers of similar quality products will be considered unless these specifications state otherwise. Such manufacturer's products may be considered as substitutions but shall not be used as a basis for bidding. In the event substitutions are submitted to the Engineer for review prior to bid, furnish descriptive catalog material, test data and samples, as well as any other pertinent data necessary to demonstrate that the proposed substitutions are acceptable equals to the specified product. No substitutions shall be made without the written consent of the Engineer.

D. The use of one named manufacturer in the schedules on the drawings is for guide purposes. The provisions of the previous paragraph shall govern in the selection of products to be used.

3.11 WARRANTY:

A. Refer to Section 017400, Warranties.

B. Provide all systems and components with a one year warranty from the date of final acceptance unless otherwise noted in the contract documents. The warranty shall cover all materials and workmanship. During this warranty period correct all defects in materials and workmanship by repair or replacement without incurring any additional cost to the Contract.

C. Warrant all refrigeration compressors for an additional four years beyond the initial one year warranty. This additional warranty shall include parts only.

3.12 FOUNDATIONS:

A. Concrete foundations are required for equipment furnished under Division 23. Unless otherwise noted, foundations shall be 4" high. Neatly chamfer all corners of the foundations.

B. Place foundation bolts in the forms when the concrete is poured. Allow 1" below the equipment bases for alignment, leveling and grouting with non-shrinking grout. Perform grouting after the equipment is leveled in place. After the grout has hardened, pull up the foundation bolts tight and shim the equipment if necessary. After removal of the forms, rub the surface of the foundation.

3.13 RECORDS AND INSTRUCTIONS FOR OWNER:

A. Accumulate during the job's progress the following data in triplicate prepared in neat brochures or packet folders and turn over to the Engineer for check and subsequent delivery to the Owner:

1. All warranties, guarantees and manufacturer's directions on equipment and materials.
2. Approved fixture brochures, wiring diagrams and control diagrams.
3. Copies of approved shop drawings.

4. Operating instructions for the mechanical systems. Include recommended periodic maintenance and seasonal changeover procedures, and suggested procedures in operation of all systems to promote energy conservation. Write these instructions expressly for this project and refer to equipment, valves and devices by mark number from the drawing schedules. Submit operating instructions and procedures in draft form for approval, prior to final issue of complete brochures. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instructions.
5. Repair parts lists of all major items of equipment including name, address and telephone number of the local supplier or agent.

B. Submit all of the above data to the Engineer for approval at such time as the last inspection is requested prior to the final inspection, but in no case less than two weeks before final inspection.

C. Give not less than two days of operating instruction, during the adjustment and testing period, to the Owner's operating personnel in order to familiarize them with the proper care and operation of the equipment. Break the 16 hours into a series of 4 hour sessions. Use the written operating instructions referred to above as the basis for this instruction.

D. A competent technician employed by the Building Automation System subcontractor shall be required to instruct the Owner in proper operating procedures and shall explain the significance of the controls literature filed in the maintenance manual over a period of two days while the system is in continuous operation.

3.14 RECORD DRAWINGS:

A. Maintain on a daily basis at the project site a complete set of "Record Drawings" reflecting an accurate dimensional record of all buried or concealed work. Mark the "Record Drawings" to show the precise location of concealed work and equipment, including concealed or embedded piping and valves and all changes and deviations in the work from that shown on the Contract Documents. This requirement shall not be construed as authorization to make changes in the layout of the work without definitive instructions from the Engineer.

B. The "Record Drawings" shall consist of a set of mylar sepia prints of the Contract drawings for this Division with the Engineer's seal and Engineer's firm name blacked out or removed. Prior to commencing work purchase from the Engineer a set of mylar sepia prints to be used for the "Record Drawings"

C. Record dimensions shall clearly and accurately delineate the work as installed. Locations shall be suitably identified by at least two dimensions to a permanent structure.

D. Mark all "Record Drawings" on the front lower right hand corner with a rubber stamp impression that states the following: "RECORD DRAWINGS. To be used for recording field deviations and dimensional data only"

3.15 INSTALLATION:

A. Install all equipment in strict conformance with the manufacturer's recommendations, as specified herein and as shown. If any conflict arises between these instructions notify the Engineer immediately for guidance.

3.16 EQUIPMENT LABELS:

A. Permanently label each item of equipment with a nameplate of sufficient size to clearly indicate the identification designation (i.e. mark number) appearing in the Contract documents.

B. Nameplates shall be 1/16" thick bakelite laminate engraved with white letters through black, or aluminum with black enameled surface and engraved letters. Handwritten marker identifications will not be acceptable.

3.17 FLAME SPREAD AND SMOKE DEVELOPED RATINGS OF MATERIALS:

A. Materials and adhesives used throughout the mechanical systems for insulation, jackets or coverings of any kind, or for piping or conduit systems or components, shall have a flame spread rating not over 25 without evidence of continued combustion, and with a smoke developed rating not to exceed 50. If such materials are to be applied with adhesives, test them as applied with such adhesives, or the adhesives used shall have a flame spread rating not over 25 and a smoke developed rating not to exceed 50.

B. Determine flame spread rating and smoke developed rating by the Method of Testing of Surface Burning Characteristics of Building Materials, NFPA 255, ASTM E84, and Underwriters' Laboratories, Inc. standards. Such materials are listed in the Underwriters' Laboratories, Inc., Building Materials List, under the heading Hazard Classification (Fire).

3.18 HAZARDOUS MATERIALS:

A. Use no products that contain any known hazardous or carcinogenic materials. Do not use products with asbestos or radioactive content.

B. Handling of any hazardous material is beyond the scope of these specifications. Any requirements for such shall be handled outside this Contract by persons contracted to do so.

3.19 FREEZE PROTECTION:

A. During construction ensure that no portion of the work is subjected to freeze damage. Take all steps necessary such as temporary heat, draining of systems, heat tape or other means to prevent damage. Do not use anti-freeze solution in potable water systems. Repair any damages as a result of freezing at no additional cost to the Contract.

B. Prior to start up of any air handling unit supplied with water coils, when ambient temperature is below 40 degrees F, make certain the intake of outside air is not low enough to drive the mixed air temperature below 35 degrees F.

END OF SECTION 230000

SECTION 230140
SCHEDULE OF SUBMITTAL DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 230000, Mechanical General, apply to all work herein.

B. See Section 013000, Submittals.

1.2 SHOP DRAWINGS:

A. Submit shop drawings or fully descriptive catalog data for all items of material and equipment furnished and installed under this Division. Submit to the Engineer six copies of all such shop drawings or catalog data.

B. Before submitting shop drawings to the Engineer for review, examine them and ensure that they correctly represent the material and equipment to which they pertain. The Contractor's review of the shop drawings is not intended to take the place of the official review by the Engineer, and shop drawings which have not been reviewed and accepted by the Engineer shall not be used in fabricating or installing any work.

C. The review of shop drawings or catalog data by the Engineer shall not relieve the Contractor from his responsibility for deviations from the drawings or specifications unless he has specifically called attention to such deviations, in writing, at the time of submission and has obtained the permission of the Engineer thereon, nor shall it relieve him from responsibility for errors of any kind in the shop drawings. When attention is called to deviations, state in the letter whether or not such deviations involve any additional cost. If no additional costs are noted, it will be assumed that no extra cost is involved for making the change.

D. Verifications and assignment of dimensions, quantities and construction means, methods, sequences and procedures are the sole responsibility of the Contractor and will not be a part of the Engineer's review.

E. Reproduction of design documents in any portion for use in a submittal is not acceptable and shop drawings submitted in this manner will be returned without review.

F. The Engineer reserves the right to require a sample of any equipment or material to be submitted for approval.

G. If resubmittals are necessary, make them exactly as specified herein for submittals. Highlight resubmittals to indicate all revisions made to the original submittal and include the applicable phrase "RESUBMITTAL NO.____".

PART 2 - PRODUCTS

2.1 GENERAL:

A. All product samples shall be new and shall bear all labels as identified by the applicable specification section or drawing.

PART 3 - EXECUTION

3.1 SUBMITTAL DATA:

A. Comply with these specifications and with the drawings in their entirety the submittal data to be furnished for this project. The submittals scheduled herein are a minimum and shall not be construed to limit the submittal data required to adequately describe all materials and equipment to be incorporated into the work.

B. Shop drawings will be returned without review unless the following information as applicable is included:

1. References to all pertinent data in these specifications or on the drawings such as sound power levels, performance curves, etc.
2. Electrical characteristics and horsepower ratings.
3. Capacities of all equipment including capacity curves for fans and pumps.
4. Construction materials.
5. UL labels and ASME stamps where required.
6. Accessories specified.
7. Manufacturer, make and model number.
8. Weights and dimensional data of all major items of equipment.
9. Motor starters where required by Division 23.

C. The data submitted shall reflect the actual equipment performance under the specified conditions and shall not simply be a copy of the scheduled data on the drawings. Identify all submitted equipment on the shop drawings with the same mark numbers as indicated on the drawings or in these specifications. Clearly highlight any deviation from any part of the Contract Documents.

D. Mechanical submittal data shall be assembled into 3-ring binders and each binder shall be provided with an identification tab for each specification section that requires submittals and an index sheet shall be included listing each tabbed section. Identify each item in each tabbed section with the paragraph number relating to the item. In the event that all required submittal items are not included with the first submittal, the 3-ring binders shall be large enough to accept all subsequent submittal data. Shop drawings not submitted in accordance with this paragraph will be returned without review.

E. Submit the bound submittals for review no later than 30 days after award of Contract. No submittal will be checked until all required submittals have been received by the Engineer.

F. Submit shop drawings for the following:

1. Starters and disconnect switches
2. Piping identification markers
3. Test, adjusting and balancing report forms
4. Pipe hangers and supports
5. Valves
6. Pumps including performance curves
7. Thermal insulation
8. Strainers
9. Test wells
10. Flexible pipe connectors
11. Automatic air vents
12. Heat tracing cable
13. Chillers including chiller test report
14. Water treatment system

15. Expansion and air separation tanks
16. Automatic temperature controls

3.2 OTHER SUBMITTALS:

A. In addition to the above provide the following prior to final acceptance of the building by the Owner:

1. As-built drawings for the mechanical installation specified in Section 230000, Mechanical General.
2. All warranties as specified in Section 230000, Mechanical General, and in other sections of these specifications.
3. Operation and maintenance instructions as specified in Section 230000, Mechanical General.
4. Test, adjusting and balancing reports as specified in Section 230593, Test and Balance.
5. A spare seal and coupling for each pump labeled for their associated pump and a certification from the manufacturer that all pumps have been properly aligned as specified in Section 232123, Centrifugal Pumps.
6. A combination pressure and temperature test kit as specified in Section 232120, Piping Accessories.
7. Two copies of welders' certificates as specified in Section 232113, Chilled Water Piping Systems.
8. Start-up report for each chiller from the chiller manufacturer's representative as specified in Section 236419, Air Cooled Chillers.
9. Two copies of the water analysis and chemical treatment performance tests and one year supply of water treatment chemicals as specified in Section 232513, Chemical Treatment System.

END OF SECTION 230140

SECTION 230145
MECHANICAL DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 230000, Mechanical General, apply to all work specified in this section.

B. Refer to Section 020700, Selective Demolition.

C. Complete the work in accordance with the Contractor's construction schedule.

1.2 DESCRIPTION OF WORK:

A. Furnish all labor, equipment, materials and incidentals required to remove all existing equipment, piping, fittings, valves, appurtenances and accessories as indicated and not required for the proper operation of the new systems and equipment. Removal shall be consistent with the final configuration of the new systems as indicated, as specified herein and as required by the Engineer. Remove the indicated equipment, piping and accessories from their present locations and, unless noted otherwise, remove them from the site.

B. Before removal of any electrically operated equipment, carefully coordinate with other trades to ensure that all power and control wiring has been disconnected and properly terminated in accordance with applicable codes or has been completely removed as indicated.

C. It should be noted that during all phases of construction the existing heating, ventilating and air conditioning systems indicated to remain shall be kept in operation. If temporary outages cannot be avoided coordinate same with the Owner and give at least 48 hours notice of such outages. If any of the existing systems to remain are damaged during demolition or construction operations, repair or replace them to the satisfaction of the Engineer without incurring any additional cost to the Contract.

D. If, during the progress of demolition or construction, any material suspected of containing asbestos, lead paint, PBC’s or other hazardous material is discovered, immediately bring it to the attention of the Engineer. Removal of such material is beyond the scope of this specification and will be performed by persons specifically contracted to do so. Suspend all work in the area until removal of hazardous materials is complete.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 GENERAL:

A. Do not proceed with the removal of any existing systems or equipment without the specific approval of the Engineer. Replace any existing equipment, piping, ductwork or appurtenances removed without proper authorization, and which are necessary for the operation of the existing systems to remain to the satisfaction of the Engineer without incurring any additional cost to the Contract.

B. Remove from the site all existing piping, tubing, insulation, hangers and supports to be removed. Do not re-use these materials in the new work.

C. Wherever piping is removed for disposal, close off the adjacent pipe that is to remain in service with blind flanges and then anchor the free end.

D. Existing equipment or accessories designated to be retained by the Owner shall be carefully be removed from their present locations, cleaned and immediately stored at a place on site as designated by the Owner. Take all necessary precautions to prevent damage to these stored items and repair all damage resulting from the operations, as directed by, and to the satisfaction of the Engineer. Prepare and turn over to the Engineer an itemized list of materials and equipment to be stored. The list shall include a detailed list of such items, how they are packaged and the place of storage.

E. Perform all work, whether indicated or not, required to properly tie in the new work to the existing systems to remain and to adapt the existing systems to any and all changes in the building structure.

F. Any pipe insulation on existing systems that are to remain and that are damaged during demolition or construction operations shall be replaced with new insulation in accordance with Section 230700, Thermal Insulation for Mechanical Systems.

G. Visit the site prior to bid and carefully examine the existing conditions affecting the work. No allowance will be made after the bid for lack of knowledge of existing conditions.

H. Remove all piping rendered useless due to changes. Plug or install blind flanges on any unused outlets in existing piping.

I. Properly close sleeves and openings in existing walls left open after the removal of piping. Sleeves shall be ground flush with the wall or floor slab both sides and filled with a non-shrinking grout troweled smooth with the existing wall or floor surface.

J. Verify in the field all existing equipment, piping and accessories indicated on the drawings as to their actual size and location. The drawings indicate the approximate extent of these existing systems but do not necessarily reflect the exact location or size.

3.2 STORAGE LOCATIONS:

A. Store all equipment to be retained by the Owner in a location chosen by the Owner. This shall not relieve the Contractor of his responsibility to protect such equipment from damage resulting from his demolition or construction operations.

END OF SECTION 230145

SECTION 230513
STARTERS AND DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 230000, Mechanical General, apply to all work specified in this section.

1.2 SCOPE OF WORK:

A. Furnish and install all motor starters and disconnect switches required by this section. Where starters and/or disconnect switches are furnished by equipment manufacturers, comply with all requirements of this section. Refer to Division 26 for disconnect switches provided therein.

B. All items required for a complete installation shall be provided.

1.3 QUALITY ASSURANCE:

A. Furnish all starters and disconnect switches to be installed under this section of these specifications to be the product of one manufacturer.

B. Starters and disconnect switches manufactured by Asea Brown Boveri (ABB), Allen-Bradley, Eaton, General Electric, Schneider or Siemens will be acceptable.

PART 2 - PRODUCTS

2.1 STARTERS AND CONTACTORS:

A. Furnish starters for all motors unless indicated to be equipment furnished with mechanical equipment, or as a part of Division 26 motor control centers.

B. Each starter shall incorporate overload elements of proper size to protect motors.

C. Coordinate starter holding coils with Section 230923, Building Automation System. Holding coils shall be 120 volt or less.

D. Provide 480V/120V control transformer with each 480 volt magnetic starter or control panel.

E. Provide 208V/120V control transformer with each 208 magnetic starter or control panel.

F. Provide one set of spare auxiliary contacts (1 normally open set and 1 normally closed set) in each starter for the future, in addition to sealed contact.

G. Starters for 3 phase motors shall be magnetic type and unless otherwise indicated shall be as follows:

1. NEMA 1 enclosure, combination line starter with disconnect (non fused) and thermal overload protection on all 3 phases.
2. 24V coil or 120V coil (to agree with control circuit - not to exceed 120V) and control transformer built-in, with fuses in primary leads and in hot secondary lead, other secondary grounded.
3. Furnish HAND-OFF-AUTO control for all automatically controlled starters and remotely controlled starters. Furnish ON-OFF selector switch where there is no automatic, remote

or interlock control.

H. Starters for single phase motors shall be manual type motor rated switches with thermal overload device (except omit overload device from switches for motors with built-in overload protection) and NEMA type 1 enclosure except for installation in public spaces or when noted for flush mounting. In such locations, provide jumbo stainless steel flush plate and pull box. Provide pilot lights in starters when noted.

2.2 DISCONNECT SWITCHES:

A. Furnish and install a disconnect switch for all equipment requiring electrical power, unless provided under Division 26.

B. When equipment manufacturer recommends over-current protection by HARC circuit breaker or fuses, the disconnect switch for that piece of equipment shall be fused at the maximum recommended fuse size. Otherwise, the disconnect shall be non-fused.

C. All disconnect switches and switch installation shall meet the requirements of NFPA 70.

D. Coordinate switch size and configuration with the equipment manufacturer's recommended maximum fuse size or other applicable data.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install equipment complete with all components connecting services and adjustments for its safe operation and in compliance with requirements of the Contract.

END OF SECTION 230513

SECTION 230523
VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 230000, Mechanical General, apply to all work specified in this section.

1.2 QUALITY ASSURANCE:

A. Codes and regulations referred to herein are minimum standards. Where the requirements of these specifications or the drawings exceed those of the codes and regulations, the drawings and specifications shall govern.

B. All valves shall be designed and manufactured with back-seating features to allow them to be re-packed under pressure when in full open position.

C. Valve marking and identification shall conform to the Manufacturer's Standardization Society for Valves, Fittings, Flanges and Unions, MSS Publication SP-25, and shall have the name or trademark of the manufacturer and working pressure cast or stamped on the valve body and the manufacturer's figure number securely attached to the stem.

D. Provide valves of one manufacturer for each trade application wherever practical to achieve maximum uniformity and to facilitate maintenance.

E. Figure numbers of various manufacturers are designated as conforming to these specifications. Valves of like characteristics may be furnished provided they meet or exceed these specifications in every respect.

1.3 GENERAL:

A. All valves requiring packing shall be designed and constructed to allow re-packing under pressure when wide open. Deep stuffing box and packing nut shall be provided to ensure firm thread attachment when fully packed.

B. All valve hand-wheels shall be non-slip, malleable or modular iron unless indicated otherwise under the individual type valve specification.

C. Non-slam check valves shall be installed at all pumps. Swing-check and lift-check valves are not acceptable.

D. All valves installed in horizontal piping shall have the stems at or above the centerline of the pipe. Valve hand-wheels shall be oriented to provide maximum accessibility.

PART 2 - PRODUCTS

2.1 CHILLED WATER SERVICE:

A. Gate valves - 2" and smaller: Class 125 - 200 lb WOG, body and screw-in bonnet shall be of ASTM B-62 cast bronze composition, threaded ends, solid wedge disk, copper-silicon alloy stem, brass packing gland, rising stem, Teflon-impregnated packing and non-slip malleable hand-wheel.

Stockham B-100
Powell 500
Milwaukee 148]

B. Globe valves - 2" and smaller: Class 125 - 200 lb WOG, body and screw-in bonnet of ASTM B-62 cast bronze composition, threaded ends, tapered renewable disc/seat closure, copper silicon alloy stem, brass packing gland with hexagonal head, Teflon-impregnated packing and non-slip malleable hand-wheel.

Stockham B-16
Powell 650
Milwaukee 502

C. Globe valves - 2-1/2" and larger: Class 125 - 200 lb WOG iron body, bronze mounted (IBBM) with body and bolted bonnet conforming to ASTM A-126 Class B cast iron, regrindable bronze seats, renewable solid disc, flanged ends, with Teflon-impregnated packing and two-piece packing gland assembly.

Stockham G-512
Powell 241
Milwaukee F-2981-M

D. Butterfly valves - 2-1/2" and larger: Lug-body type, 200 lb CWP conforming to ASTM A-126 Class B cast iron drilled and tapped to ANSI 125-150 flange standard, field replaceable Buna-N sleeve, with 316 type stainless steel stem, Buna-N O-ring, lever handles with memory stops. Any butterfly valve used as a balancing valve shall have memory stops and a means for measuring pressure drop across the valve such as Pete's plugs. Butterfly valves shall be rated for dead-end service.

Stockham LD-712
Centerline LT
Grinnell LC-8281-3
Milwaukee Series CL224B

E. Check valves - 2" and smaller: Class 125 - 200 lb WOG, threaded ends, body and caps shall be of ASTM B-26 cast bronze composition, integral and renewable seat, swing type renewable and regrindable disc. Cap collar shall not extend past the body neck and have wide flat face for wrench removal.

Stockham B-319
Powell 578
Milwaukee 509

F. Check valves - 2-1/2" and larger: Class 125 - 200 lb WOG iron body, bronze mounted, flanged ends, globe type silent check valves and stainless steel spring. Valves shall be designed to completely close with a 1/2 psi positive discharge head.

Muessco 105 AP
Apco 600-636
Milwaukee 1800 Series

G. Ball valves - 2" and smaller: 720 lb CWP, ASTM B-16 brass body composition, threaded ends, replaceable reinforced Teflon seats. Full port opening in type 316 stainless steel ball, stainless steel stem, reinforced Teflon seal and thrust washer and cadmium plated steel nut and handle.

Stockham S-217 BR-R-T

H. Drain valves: Threaded end, bronze body renewable composition disc, wheel handle, 3/4 NPT inlet, 3/4" house outlet.

Watts Regulator BD-1
Woodford 24

2.2 DOMESTIC COLD WATER SERVICE:

A. Gate valves - 2" and smaller: Class 125 - 200 lb WOG and shall have body and threaded bonnet of ASTM B-62 cast bronze composition, solid wedge disc, copper-silicon alloy stem, brass packing gland, rising stem, solder ends, Teflon-impregnated packing and malleable iron hand-wheel.

Stockham B-108
Powell 1821
Milwaukee 149

B. Ball valves - 2" and smaller: 600 lb CWP, have cast brass body, replaceable reinforced Teflon seat, conventional port, blowout proof stem, chrome-plated brass ball, solder ends with extended solder cups. Provide stem extension to ensure handle clears insulation where provided on insulated pipes.

Stockham S-216-BR-R-T
Apollo 70-200
Milwaukee "Butterball" BB2-350

C. Globe valves - 2" and smaller: Class 125 - 200 lb WOG, body and union bonnet of ASTM B-62 cast bronze composition, solder ends, composition disc, copper-silicon alloy stem, brass packing gland, Teflon-impregnated packing and malleable iron hand-wheel.

Stockham B-14T
Powell 1823

D. Pressure reducing valves - 2" and smaller: Bronze body, screwed ends, renewable seat and disc, high temperature diaphragm for hot or cold water service, Y type strainer, water tight cage assembly, adjustable outlet pressure.

Watts Regulator 223-SB
Wilkins Regulator 500-YS-BR
A.W. Cash E-55 Series
Mueller H-93000 Series

E. Backflow preventers: Reduced pressure principle backflow preventers consisting of assembly including shutoff valves and strainer at the inlet. Backflow preventers shall include test cocks, air-gap drain funnel and pressure differential relief valve located between two positive seating check valves. Backflow preventers shall conform to ASSE Standard 1013.

Watts Regulator 909
Hersey Products FRP-11
Wilkins 575-RP
Clayton RP-1

F. Drain valves: Threaded ends, bronze body renewable composition disc, wheel handle, 3/4" NPT inlet, 3/4" hose outlet.

Watts Regulator BD-1
Woodford 24

PART 3 - EXECUTION

3.1 GENERAL:

A. Automatic air vents shall be installed with gate or ball valves.

B. Adjust pressure reducing valve serving compression tanks to maintain between 5 and 10 psig at the highest point in the system.

END OF SECTION 230523

SECTION 230529
PIPE HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 230000, Mechanical General, apply to all work specified in this section.

1.2 GENERAL REQUIREMENTS:

A. Furnish hangers to support the required loads. Where necessary, design supports to permit movement due to expansion and contraction. Where the drawings show details of supports and anchors, conform to details shown. Where details are not shown, conform to general requirements specified herein.

B. Do not use "C" clamps to support pipe hangers from the structure.

C. Do not pierce waterproofing or insulation vapor barrier with supports or support bolts.

D. All ferrous metal hangers, supports and rods shall be cadmium plated or galvanized.

1.3 QUALITY ASSURANCE:

A. All hangers, support, anchors and guides shall be in accordance with the American National Standard Code for Pressure Piping, ANSI/B31.1 with Addenda 31.1 OA-69 and Federal Specification WW-H-17.

B. Provide an adequate piping suspension system using standard commercially available pipe hangers and accessories.

C. Hang horizontal suspended pipes using adjustable pipe hangers with bolted hinged loops or turnbuckles. Do not use chains, wire, perforated strap iron, flat steel straps or similar construction.

PART 2 - PRODUCTS

2.1 CHILLED WATER SERVICE:

A. Suspended insulated pipe:

1. Upper attachments:
   a. Support piping in concrete construction with cadmium plated, malleable iron expansion case anchor.
      Grinnell Figure 117
      B-Line Series LA
      Elcen Figure 212
   b. Where hangers are required between structural concrete beams provide side beam brackets attached to the upper 1/3 of the beam, and all auxiliary steel for the installation of the pipe hangers. Supports shall be designed in accordance with the AISC Steel Handbook.
      Grinnell Figure 202
      B-Line Figure B3062
      Elcen Figure 27

c. Support piping in steel construction with adjustable beam clamps and tie rods.
Grinnell Figure 218
B-Line Figure B3054
Elcen Figure 95 and 76

d. Where hangers are required between structural steel beams or joists provide a welded steel bracket sized to meet the constraints of the structural installation. The bracket shall be attached with a continuous weld between the support and the structural member. Supports shall be designed in accordance with the AISC Steel Handbook.
Grinnell Figure 195
B-Line Figure B3066
Elcen Figure 57

2. Intermediate attachments:

a. Supports for horizontal piping shall be all threaded carbon steel, ASTM A-107 of the following sizes:

Pipe Size	Hanger Rod Diameter
2" and smaller	3/8"
2-1/2"	1/2"
3"	1/2"
4"	5/8"
6" and larger	7/8"

3. Pipe attachments:

a. Hangers for horizontal piping shall be clevis type with vertical adjustment. Hangers for insulated pipes shall be selected to bear on a pipe shield outside of the insulation.
Grinnell Figure 260
B-Line Figure B3100
Elcen Figure 12

b. Hangers for multiple horizontal piping shall be trapeze type.
Grinnell Figure 46
B-Line Figure B22
Unistrut Model P3200
Michigan Hanger Figure 380

c. Provide an insulation protection shield between the hangers and the pipe insulation.
Grinnell Figure 167
B-Line Figure B3151
Elcen Figure 400

B. Wall supports:

1. Where piping is run adjacent to walls or steel columns welded steel brackets may be used. The bracket shall either be bolted to the wall with a back plate or welded to a mounting flange then attached to the wall or column. The back plate or flange shall be of such size and thickness as to distribute the weight properly.
Grinnell Figure 195
B-Line Figure B3066
Elcen Figure 57

2. Insulated pipes shall be provided with a protection shield between the hanger and the pipe insulation.
Grinnell Figure 167
B-Line Figure B3151
Elcen Figure 400

C. Floor supports:

1. Where pipe runs are located next to the floor the pipe shall be supported with an adjustable pipe saddle support and floor flange.
Grinnell Figure 264
B-Line Figure B3092
Elcen Figure 50

2.2 PLUMBING SERVICE:

A. Suspended domestic cold water piping:

1. Upper attachments:
a. Support piping in concrete construction with cadmium plated, malleable iron expansion case anchor.
Grinnell Figure 117
B-Line Series LA
Elcen Figure 212
b. Where hangers are required between structural concrete beams provide side beam brackets attached to the upper 1/3 of the beam, and all auxiliary steel for the installation of the pipe hangers. Supports shall be designed in accordance with the AISC Steel Handbook.
Grinnell Figure 202
B-Line Figure B3062
Elcen Figure 27
c. Support piping in steel construction with adjustable beam clamps and tie rods.
Grinnell Figure 218
B-Line Figure B3054
Elcen Figure 95 and 76
d. Where hangers are required between structural steel beams or joists provide a welded steel bracket sized to meet the constraints of the structural installation. The bracket shall be attached with a continuous weld between the support and the structural member. Supports shall be designed in accordance with the AISC Steel Handbook.
Grinnell Figure 195
B-Line Figure B3066
Elcen Figure 57
2. Intermediate attachments:
a. Supports for horizontal piping shall be all threaded carbon steel, ASTM A-107 of the following sizes:

Pipe Size	Hanger Rod Diameter
2" and smaller	3/8"

3. Pipe attachments:
a. Hangers for horizontal piping shall be clevis type with vertical adjustment. Hangers for insulated pipes shall be selected to bear on the outside of the insulation.
Grinnell Figure 260
B-Line Figure B3100
Elcen Figure 12
b. Hangers for multiple horizontal piping systems shall be trapeze type.
Grinnell Figure 46
B-Line Figure B22
Unistrut Model P3200
Michigan Hanger Figure 380

c. Provide an insulation protection shield between all hangers and the pipe insulation.
Grinnell Figure 167
B-Line Figure B3151
Elcen Figure 400

B. Wall supports:

1. Where piping is run adjacent to masonry walls or steel columns welded steel brackets may be used. The bracket shall be either bolted to the wall with a back plate or welded to a mounting flange then attached to the wall or column. The back plate or flange shall be of such size thickness as to distribute the weight properly.
Grinnell Figure 195
B-Line Figure B3066
Elcen Figure 57
2. Insulated pipe shall be provided with a protection shield between the hanger and the pipe insulation.
Grinnell Figure 167
B-Line Figure B3151
Elcen Figure 400

C. Floor supports:

1. Where pipe runs are located next to the floor the pipe shall be supported with an adjustable pipe saddle support and floor flange.
Grinnell Figure 264
B-Line Figure B3092
Elcen Figure 50
2. Vertical piping shall be supported at every floor using riser clamps. Provide a steel plate and neoprene sandwich type pad at each riser clamp for support.
Grinnell Figure 261
B-Line Figure B3373
Elcen Figure 1

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Support horizontal equipment such as in-line pumps, strainers and air separators independently of the piping system.

B. Hang pipe from substantial building structure. Do not hang pipe from other piping, ductwork, ceilings or steel decking.

C. Provide a hanger within one foot of each elbow.

D. Secure vertical piping drops along columns or walls at the top and bottom of the drop and every 10'-0" on center.

E. Provide a hanger within one foot of each riser in addition to the riser clamp support at every floor.

F. Isolate copper tubing from steel supports, anchors and metal studs to prevent electrolysis. Isolate piping with neoprene pads, sheet lead strips or plastic inserts. Duct tape shall not be used to isolate piping.

G. Spacing of hangers and supports for above-ground horizontal piping shall be as follows:

	Nominal Pipe Size	Maximum Spacing of Supports
1.	Steel pipe	
	1-1/4" and smaller	7'-0"
	1-1/2"	9'-0"
	2"	10'-0"
	2-1/2"	11'-0"
	3"	12'-0"
	4"	14'-0"
	5"	16'-0"
	6"	17'-0"
	8"	19'-0"
2.	Copper tubing	
	1/2"	5'-0"
	3/4"	5'-0"
	1"	6'-0"
	1-1/4"	7'-0"
	1-1/2"	8'-0"

END OF SECTION 23 0529

SECTION 230553
IDENTIFICATION OF PIPING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 230000, Mechanical General, apply to all work specified in this section.

PART 2 - PRODUCTS

2.1 PIPE MARKINGS:

A. Pipe markings shall be manufactured, pre-printed markers in accordance with the following:

1. No taped or self-adhering markers will be acceptable.
2. Markers shall be strapped in place using nylon fasteners.
3. Markers shall be non-corrosive, non-conducting, mildew resistant and impervious to moisture.
4. Direction of flow arrows shall be placed adjacent to color bands. Band, letter sizes and colors shall be as indicated below.
5. Piping identification markings manufactured by W.H. Brady Co., Seton, Grainger or approved equal will be acceptable.

2.2 PIPE BAND AND LETTER SIZE:

A. Pipe band and letter sizes shall conform to ASHRAE standards and the following table:

O.D. of Pipe or Pipe Covering	Width of Color Band	Size of Letters and Numbers
1-1/4" and smaller	8"	1/2"
1-1/2" to 2"	8"	3/4"
2-1/2" to 5"	12"	1-1/4"
6" and larger	24"	2-1/2"

2.3 IDENTIFICATION:

A. Band legend and letter color shall conform to the following table:

Piping Band	Legend	Letters	Band Color
Chilled Water Supply	CHWS	White	Green
Chilled Water Return	CHWR	White	Green
Domestic Cold Water	CW	White	Green

PART 3 - EXECUTION

3.1 GENERAL:

A. Locate piping identification at the following areas:

1. At each riser.
2. At each valve.
3. Where pipes pass through walls (one each side).
4. At or near each change in direction or height.

5. Every 40 feet along continuous runs.
6. Within 4 feet of the entrance or exit to a vessel, tank or piece of equipment.

B. Indicate flow direction with arrows of matching style and color and placed so that the arrow points away from the legend.

C. A copy of the pipe identification legend shall be included in the Operation and Maintenance manual.

END OF SECTION 230553

SECTION 230593
TEST AND BALANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 230000, Mechanical General, apply to all work specified in this section.

1.2 SCOPE OF WORK:

A. Procure the services of an independent Test and Balance agency that is independent of any contractor or manufacturer to perform the testing and balancing and to prepare reports to the General Contractor and to the Engineer. The Test and Balance agency shall be a certified member of the Associated Air Balance Council (AABC) or the National Environmental Balancing Bureau (NEBB).

B. Perform testing and balancing in accordance with the 6th. edition of the AABC National Standards (2002) for Total System Balance, and in accordance with the scope of work defined herein.

C. The Test and Balance agency, as part of its contract, shall act as an authorized inspection agency, responsible to the Owner and shall, during the test and balance, list all systems that require correction or that have not been installed in accordance with the drawings and specifications.

D. A single agency shall be responsible for all phases of testing and balancing.

E. Do not begin testing and balancing until all systems have been completed and are in full working order. Put all heating, ventilating and air conditioning equipment into full operation and continue the operation of same during each working day of testing and balancing.

F. Upon the completion of the test and balance work the agency shall compile the test data and submit four copies of the complete report to the Engineer for his evaluation and approval.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Provide all required instrumentation, equipment, tools, devices and utility services to perform the operations as specified herein.

B. Calibrate instruments used for testing and balancing of systems within six months preceding the tests and check them for accuracy prior to start of work.

C. Instruments shall be of a type normally recognized as adequate and accurate for the test contemplated. List the types of instruments, including manufacturer, serial number and latest calibration date as a part of the submitted test data.

2.2 PATCHING MATERIALS:

A. Unless indicated otherwise, use same products as used in the work for patching holes in insulation which have been cut or drilled for test purposes, including access for test instruments, attaching jigs and similar purposes.

PART 3 - EXECUTION

3.1 REQUIRED DOCUMENTS:

A. Provide the following, in a timely fashion, to the Test and Balance agency:

1. Contract drawings (complete set).
2. Applicable specifications (Division 23 and 26 as a minimum).
3. Related addenda, change orders, reviewed shop drawings, reviewed equipment manufacturer's submittal data and reviewed temperature control drawings.

3.2 COOPERATION:

A. Cooperate fully with the Test and Balance agency and provide them with completely operable systems, the right to adjust the systems and access to the system components.

3.3 OPERATING TEST:

A. Make a complete system operating test for a period of eight hours with controls set in their various positions to ensure proper operation under the design conditions. Make all tests and final adjustments to the complete satisfaction of the Owner and the **Architect**.

B. Schedule the operating test four weeks prior to scheduled completion date.

3.4 CONTROL PERFORMANCE CHECK:

A. The results produced by the operation of automatic controls shall be checked by the Test and Balance agency. List and report controls requiring adjustment. The agency shall be responsible only for final settings.

3.5 SETTINGS:

A. Permanently mark the settings of all valves and other adjustment devices in a manner that will allow the settings to be restored. If a balancing device is provided with a memory stop it shall be set and locked.

3.6 WATER BALANCING PROCEDURE:

A. Prepare the hydronic systems for balancing in the following manner:

1. Open all valves to full open position. Close coil bypass valves. Set mixing valves to full coil flow.
2. Check pump rotation.
3. Check expansion tanks to determine they are not air bound and that the system is properly charged.
4. Check all air vents at the high points of the system to determine that all are installed and operating freely.

B. After completion of the preliminary work described above, follow the following balancing procedure:

1. Set pumps to the specified gallons per minute delivery.
2. Upon completion of flow readings and adjustments re-check settings at the pumps and readjust if necessary.

3.7 WATER BALANCING REQUIREMENTS:

A. Refrigeration machines: Adjust and service each refrigeration machine in accordance with the manufacturer's recommendations. Furnish data, tabulating the following:

1. Suction and condensing temperatures and pressures.
2. Temperatures of entering and leaving chilled water.
3. Voltage and ampere input of motors under full load (one for each phase leg).
4. Capacity of machine in BTUH as calculated from flow and temperature drop.
5. Quantity of chilled water circulated through machine in GPM.

B. Pumps: Adjust and service pumps in accordance with the manufacturer's recommendations. Furnish data tabulating the following:

1. Quantity of water circulated by in GPM.
2. Suction and discharge pressures across pump in PSIG.
3. Voltage and ampere input of motor (one reading for each phase leg on three phase motors).
4. Percent efficiency of pump.
5. Horizontal, vertical and angular misalignment of pump and driver after two hours operation and after remaining idle overnight.

END OF SECTION 230593

SECTION 230700
THERMAL INSULATION FOR MECHANICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 230000, Mechanical General, apply to all work specified in this section.

1.2 DESCRIPTION:

A. All insulation products shall meet NFPA requirements for a Flame Spread Rating not to exceed 25, a Smoke Developed Rating not to exceed 50 and a Fuel Contributed Rating not to exceed 50.

B. Do not use staples for securing insulation.

C. Insulation and vapor barrier shall be continuous through wall sleeves.

D. Supports for insulated piping shall be outside the insulation. For pipe sizes 2-1/2 inch and larger provide inserts and pipe shields at pipe hangers. For pipe sizes 2 inch and smaller provide pipe shields only at pipe hangers. Inserts shall be foamglass or calcium silicate insulation and shall be 2" longer than the pipe shields.

E. Do not store insulation materials in the building until it is enclosed and dry. Do not install wet insulation.

F. Do not apply insulation products with self-sealing type lap jackets at ambient temperatures below 40 degrees F.

G. Paint ferrous metal piping installed outdoors with one coat of rust inhibiting primer before installing insulation.

1.3 QUALITY ASSURANCE:

A. Codes and regulations referred to in these specifications are minimum standards, however if the requirements of these specifications exceed those of the codes and regulations, the specifications shall govern.

B. Any methods of application of insulation products or finishes not specifically detailed herein shall be applied in accordance with the insulation manufacturer's published recommendations. Apply insulation by experienced workers regularly employed in this type of work.

C. Insulation products manufactured by Owens-Corning, Johns-Manville, CertainTeed, Knauf or Armstrong will be acceptable.

D. Adhesives, mastics and coatings manufactured by Benjamin Foster, Childers, Insul-Coustic or Minnesota Mining and Manufacturing Co. (3M) will be acceptable.

PART 2 - PRODUCTS

2.1 PRE-MOLDED GLASS FIBER PIPE INSULATION:

A. Pipe insulation shall be 4 pcf density fibrous glass wool accurately molded to conform to the outside diameter of the pipe. Insulation shall be the one piece snap-on or self-sealing lap type with

white all-service jacket and vapor barrier. Insulation shall be suitable for use on hot or cold pipes with a temperature range of 35 to 400 degrees F. Thermal conductivity shall not exceed 0.26 at 75 degrees F mean temperature.

2.2 PRE-MOLDED GLASS FIBER INSULATION THICKNESS IN INCHES:

Service	Up to 1"	1-1/4" to 2"	2-1/2" and Over
Plumbing systems			
Cold water	1/2"	1/2"	1/2"

2.3 CELLULAR GLASS PIPE INSULATION:

A. Pre-molded pipe insulation shall be 8 pcf minimum density rigid cellular glass and vapor barrier with a thermal conductivity not to exceed 0.25 at 75 degrees F mean temperature.

2.4 CELLULAR GLASS INSULATION THICKNESS IN INCHES:

Service	Up to 1"	1-1/4" to 2"	2-1/2" to 3-1/2"	4" and Over
Cooling systems				
Chilled water	1"	1-1/2"	2"	2"

2.5 GLASS FIBER SEMI-RIGID BOARD INSULATION:

A. Insulation shall be 4 pcf density semi-rigid board material having long glass fibers with resin binder. Thermal conductivity shall not exceed 0.23 at 70 degrees F mean temperature.

B. Insulate the following with 1-1/2" thick glass fiber semi-rigid board insulation:

1. Air separation tanks.
2. Expansion tanks.

2.6 FOAMED PLASTIC SHEET AND TUBING:

A. Foamed plastic sheet and tubing shall have a minimum density of 4.5 pcf. Thermal conductivity shall not exceed 0.28 at 75 degrees F mean temperature.

B. Apply and secure insulation and seal all joints with Armaflex 520 adhesive so as to maintain a continuous vapor barrier.

C. Insulate the following with 1" thick foamed plastic tubing insulation:

1. Chilled water system appurtenances such as gauge cocks, couplings, valve stems and the like.

D. Insulate the following with 1-1/2" thick foamed plastic sheet adhered to a removable 20 gauge aluminum casing:

1. Chilled water pump heads.
2. Chiller cooler, water boxes and suction pipe (unless factory insulated).

2.7 ADHESIVES, MASTICS, COATINGS AND VAPOR BARRIERS:

A. The treatment of pipe insulation jackets to impart flame spread and smoke developed ratings shall be permanent. The use of water-soluble treatments is prohibited.

B. Vapor barriers shall be installed on all pipe insulation which shall have a perm rating of not more than 0.05 perms. Adhesives, coatings and mastics shall have a perm rating of not less than 0.25 perms.

2.8 INSULATING CEMENT:

A. Insulating cement shall be Owens-Corning 110 mineral wool, Benjamin Foster, or 3M All Purpose Cement. Where insulating cement is applied to pipe fittings in concealed locations it shall be "one-coat" cement.

2.9 GLASS CLOTH JACKET:

A. Glass cloth jacket on pipe and equipment insulation shall be open weave, standard weight.

PART 3 - EXECUTION

3.1 GENERAL:

A. Clean all surfaces to be insulated of all loose scale, dirt, rust, oil and other foreign matter and thoroughly dry before applying insulation.

B. Perform pressure tests required by other sections before insulation is applied.

C. Where existing insulation is damaged due to demolition or construction operations, remove and replace it with new insulation to match the existing work or as specified herein for new insulation.

D. Insulate completely all metal surfaces of piping other than hangers.

E. Insulation surface finishes shall present a tight, smooth appearance and the surface finish shall be extended to protect all raw ends and edges of the insulation.

3.2 INSULATION FOR PIPING:

A. Insulate all valves including valve bonnets on chilled water piping, strainers, flanges and fittings. Use pre-molded material where available.

B. Install insulation materials with smooth and even surfaces, with jackets drawn tight and cemented down smoothly at longitudinal seams and end laps. Do not use scrap pieces of insulation where a full length of insulation will fit.

C. Install insulation, jackets and coatings continuous through wall openings and through pipe sleeves.

D. Insulate valves, strainers, fittings, and flanges with field fabricated, multiple mitered segments of molded pipe insulation of the same thickness and material as the adjoining pipe insulation. Secure segments with 20 gauge galvanized steel wire and apply a smoothing coat of insulating cement. Use white fabric and mastic on all fittings exposed to view such as in mechanical rooms.

E. Insulate all chilled water piping appurtenances such as thermometer wells, gauge cocks, valve stems and the like with 1" thick foamed plastic sheet and tubing insulation, secured in place with 1/2" wide aluminum bands spaced 18" on center. Seal all joints with flexible joint sealer and finish with white vapor barrier mastic.

F. On chilled water piping exposed outdoors, oversize the insulation to allow for heat tape, and do not apply insulation until the pipe has been painted and the heat tape applied. Finish the insulation with standard weight glass cloth set in a 1/16" thick bed of vapor barrier. After drying, apply a 1/16" coat of weatherproof vapor barrier similar to "Seal-Kote". Protect insulation, including all fittings, with 0.024" thick corrugated aluminum, overlapped at the seams a minimum of 2", arranged to shed water and secured with aluminum bands spaced not more than 16" apart.

3.3 INSULATION FOR EQUIPMENT:

A. Secure insulation to the equipment with insulation hangers with self locking washers, copper wire or galvanized steel bands. Miter the insulation to ensure a tight fit. Seal all joints with mineral wool insulating cement. Finish with standard weight glass cloth set between two coats of 1/16" thick white mastic.

B. Insulate the flanged ends of chilled water pumps with a 20 gauge removable aluminum casing, lined with 2" thick foamed plastic sheet, adhered to all inside surfaces of the casing. Fabricate the casing in two sections, joined with galvanized steel bolts, nuts and washers and arranged so that the casing may be removed and reinstalled without damaging the insulation.

3.4 MISCELLANEOUS EQUIPMENT:

A. Insulate bypass chemical feeders and associated piping the same as the piping system in which they are installed.

3.5 CLEANING:

A. Prior to final acceptance, clean the finished surfaces of all exposed insulation of all stains and blemishes. If necessary to obtain a new appearance, coat any discolored insulation with off-white latex based semi-gloss paint or lagging adhesive.

END OF SECTION 230700

SECTION 230923
BUILDING AUTOMATION SYSTEM

PART 1 - GENERAL

1.01 OVERVIEW:

A. This document contains the specification and input/output summaries for a Building Automation System (BAS).

B. The system shall provide the Direct Digital Control (DDC), Energy Management and Building Automation System (BAS) for the air conditioning, heating and ventilating systems and shall interface with other microprocessor based building subsystems as detailed in the Input/Output Summaries and as specified herein. [All damper and valve actuators shall be electronic.]

1.02 INSTRUCTIONS TO BIDDERS:

A. The system specified in this document shall be native BACnet architecture providing full operator access via the Internet or Local Area Network utilizing only a browser for full operator access and control in through a thin-client architecture. The requirements are described in this specification [and the attached I/O Points Schedule.]

1.03 SCOPE OF WORK:

A. Furnish and install all necessary software and hardware, wiring, [pneumatic tubing] and computing equipment in compliance with this specification. Any variances from this specification or related documentation shall be submitted in writing at the time of bid.

B. System Requirements:

1. All material and equipment used shall be standard components regularly manufactured and available and not custom designed especially for this project
2. The system architecture shall be fully modular permitting expansion of application software, system peripherals and field hardware.
3. The system, upon completion of the installation and prior to acceptance of the project, shall perform all operating functions as detailed in this specification.

C. Equipment:

1. Provide the following system hardware:
   a. PC’s, PDA’s, server(s), routers, modems and control modules as specified.
   b. All sensing devices, relays, switches, indicating devices and transducers required to perform the functions [as listed in I/O Summary Tables.]
   c. All monitoring and control wiring [and air tubing].
2. Provide all system software identified herein including the BAS Server, fully configured database, graphics, reports and alarm/events. The Graphical User Interface (GUI) shall be completely Web based as specified herein.

D. Input/Output Point Summary Schedule. The system as specified shall monitor, control and calculate all of the points and perform all the functions of the specified equipment.

E. Codes and Regulations. All electrical equipment and material, and its installation, shall conform to the current requirements of the following authorities:

1. Occupational Safety and Health Act (OSHA).
2. National Electric Code (NEC).
3. National Fire Code.
4. International Mechanical Code.
5. International Building Code.

F. All distributed, standalone and unitary controllers supplied shall be in compliance with the following listings and standards:

1. UL916 for Open Energy Management (for U.S. and Canada).
2. FCC Part 15, Sub-Part B, Class A.
3. CE Electro Magnetic Compatibility.

G. The control system manufacturer shall be ISO9001 listed for design and manufacture of environmental control systems for precise control and comfort, indoor air quality, HVAC plant operation, energy savings and preventative maintenance. ISO Certification shall be by a registrar that is accredited by an internationally recognized organization such as RAB. Copy of ISO9001 certificate shall be submitted with bid.

H. Where two or more codes conflict, the most restrictive shall apply. Nothing in this specification or related documentation shall be construed to permit work not conforming to applicable codes.

1.04 GENERAL CONDITIONS:

A. Any changes in the scope of work shall be authorized by a written change order.

B. Correction of Work:

1. Contractor's Responsibility. Promptly correct all work the **Architect** finds defective or failing to conform to the Contract Documents. Bear all cost of correcting such work.
2. If, within the warranty period required by the Contract Documents, any of the work is found to be defective or not in accordance with the Contract Documents, correct it promptly after receipt of a written notice from the **Architect** to do so. The **Architect** shall give notice promptly after discovery of the condition.

C. Coordinate any necessary changes in work scheduling with the **Architect** to minimize disruption.

1. Protect the installed works by other trades.
2. Coordinate with other trades.
3. Repair any damage caused by his work to the building and equipment at no additional cost to the owner.

D. Warrant, from the date of final acceptance by the **Architect** that all systems, subsystems, component parts and software are fully free from defective design, materials and workmanship for a period of one year or longer as indicated in this specification.

1.05 SUBMITTALS, DOCUMENTATION, ACCEPTANCE AND TRAINING:

A. Submittals:

1. A minimum of four copies of shop drawings shall be submitted and shall consist of a complete list of equipment, materials, manufacturer's technical literature, cut-sheets and installation instructions. Drawings shall contain proposed layout, complete wiring, routing, schematic diagrams, tag number of devices, software descriptions, calculations, installation details and any other details required to demonstrate that the system will function properly.
2. Provide a printout all Graphical Programs, identifying the specific HVAC or mechanical/electrical subsystem being controlled.
3. Shop drawings shall be approved before any equipment is installed. Allow a minimum of fourteen days for drawing approval.
4. All drawings shall be reviewed after the final system checkout and updated or corrected to provide 'as-built' drawings to show exact installation. All shop drawings will be acknowledged in writing by the **Architect** before installation is started and again after the final checkout of the system. The system will not be considered complete until the 'as-built' drawings have received their final approval. Deliver three sets of 'as-built' drawings.

B. Operating and Maintenance (O&M) manuals for the system shall be made available electronically using Acrobat 4.x (PDF) format and include the categories Workstation User's Manual, Project Engineering Handbook and Software Documentation.

1. BAS User's Manual shall contain as a minimum:
   a. System overview.
   b. Networking concepts.
   c. Launching a web browser from a networked PC/PDA and login.
   d. Graphical User Interface (GUI) screen menus and their definitions.
   e. Creating, modifying or deleting schedules.
   f. Uploading and downloading software to the field hardware.
   g. Creating historical trends, collecting trend data and generating trend graphs.
   h. Enabling and assigning alarms and messages to reporting actions/groups.
   i. Report generation and ‘third party software’.
   j. Backing up software and data files.
2. Project Engineering Manual shall contain as a minimum:
   a. System architecture overview.
   b. Hardware cut-sheets and product descriptions.
   c. Deliver three sets of 'as-built' drawings. All drawings shall be reviewed after the final system checkout and updated to provide 'as-built' drawings. The system will not be considered complete until the 'as-built' drawings have received their final approval.
   d. Installation, mounting and connection details for all field hardware and accessories
   e. Commissioning, setup and backup procedures for all control modules/accessories, BAS server software and database.
   f. Listing of basic terminology, alarms/messages, error messages and frequently used commands or shortcuts.
3. BAS Software Documentation shall contain as a minimum:
   a. Provide a printout all Graphical Programs, detailing their application to specific HVAC equipment and electrical/mechanical subsystems, together with a glossary or icon symbol library detailing the function of each graphical icon. Revisions made as a result of the submittal process, during the installation, start-up or acceptance portion of the project, shall be accurately reflected in the "as-builts".

b. Graphical representation of the mechanical equipment hierarchy for the project including all equipment controlled by the BAS. [For example, a VAV terminal box may be the source for increased cooling demand and require the primary VAV AHU to operate which, in turn, requires the chillers to operate.]
c. Detailed listing of all alarm and event messages programmed for designated mechanical/electrical equipment and required operator action.

C. Acceptance Test:

1. Upon completion of the installation, start up the system and perform all necessary calibration, testing, and debugging operations. In the presence of the Owner's representative perform an acceptance test.
2. When the system performance is deemed satisfactory, the system parts will be accepted for beneficial use and placed under warranty. At this time the **Architect** will issue a notice of completion and the warranty period shall start.

D. Provide training of designated personnel in the operation, maintenance and programming of the system.

PART 2 - PRODUCTS

2.01 SYSTEM OVERVIEW:

A. Provide system software based on a server/thin-client architecture, designed around the open standards of web technology. The BAS server shall communicate using ASHRAE's BACnet/IP protocol and offer concurrent support over the same data-link of the protocols LonWorks and SNMP. Server shall be accessed using a web browser over the DDC system Intranet provided under this contract and remotely over the Internet.

B. The intent of the thin-client architecture is to provide the operator(s) complete access to the BAS system via a web browser. The thin-client web browser Graphical User Interface (GUI) shall be browser and operating system agnostic, meaning it will support Microsoft and Netscape Navigator browsers (6.x or later versions) and Windows as well as non-Window operating systems. No special software (active-x components or fat Java clients) shall be required to be installed on the PC's/PDA's used to access the BAS via a web browser.

C. The BAS server software shall support at least the server platforms Windows NT, Sun Solaris and Linux. The BAS server software shall be developed and tested by the manufacturer of the system standalone controllers and network controllers/routers. Third party manufactured and developed BAS software will not be acceptable.

D. The web browser GUI shall provide a completely interactive user interface and shall offer the following features as a minimum:

1. Trending.
2. Scheduling.
3. Downloading memory to field devices.
4. Real time 'live' Graphic Program Diagnostics for troubleshooting.
5. Tree navigation.
6. Parameter change of properties.
7. Setpoint adjustments.

8. Alarm/Event information.
9. Configuration of operators.
10. Execution of global commands.

E. Software Components: All software components of the BAS system software shall be installed and completed in accordance with the specification. BAS system components shall include:

1. Server Software, Database and Web Browser Graphical User Interface.
2. System Configuration Utilities for future modifications to the system.
3. Graphical programming.
4. Direct digital control software.
5. Application software.

F. The BAS server software shall utilize a Java DataBase Connectivity (JDBC) compatible database such as MS Access, MS SQL 7.0, Oracle 8i or IBM DB2. BAS systems written to proprietary databases will not be acceptable.

G. The BAS server database shall be Java DataBase Connectivity (JDBC) compatible, allowing real time access of data via the following standard mechanisms:

1. Common Object Request Broker Architecture (CORBA).
2. OLE/OPC (for Microsoft Client's/Server platform only).
3. Import/Export of the database from or to XML (extensible Mark-up Language).

H. The native protocol for the BAS server software shall be BACnet as defined by ASHRAE standard SPC135. In addition, the software shall be able to support concurrent operation of multiple standard and non-standard protocols such as MODBUS, SMNP or LonWorks over IP. LonMark or LonWorks devices shall be networked from LonTalk to an Ethernet Datalink and IP data structure, using a LonTalk to IP Router like an i1000 Echelon Router. Binding of all LON devices including Domain, Subnet, Node ID and the SNVT's structure, in addition to configuration of all network variables for IP tunneling, shall be the responsibility of the LON device supplier. All I/O points [listed in the I/O Point Summary] shall be configured through the i1000 LON/IP router(s). A copy of Echelon's proprietary LNS Services and LON Manager shall be supplied at no cost by the supplier of the LON devices.

I. The BAS system software (client and server) shall be operating system and hardware agnostic, being able to run on Windows 98, Windows 2000, Windows NT, Sun Microsystems Solaris and Red Hat Linux.

J. The GUI shall be thin client or browser based and shall meet the following criteria:

1. Only a 6.x browser (Explorer/Navigator) shall be required as the GUI and a valid connection to the server network. No installation of any custom software shall be required on the operator's GUI workstation/client. Connection shall be over an intranet or the Internet. A firewall shall be installed to protect the customer's Intranet.
2. Communication between the Web Browser GUI and BAS server shall be encrypted using 128-bit encryption technology within Secure Socket Layers (SSL). Communication protocol shall be Hyper-Text Transfer Protocol (HTTP).
3. BAS Server software shall support other browsers used by Personal Digital Assistants like 3Com Palm Pilots and other Internet appliances specified herein.

2.02 WEB BROWSER GRAPHICAL USER INTERFACE:

A. The Thin Client web browser GUI shall provide a comprehensive user interface. Using a collection of web pages, it shall be constructed to 'feel' like a single application and provide a complete and intuitive mouse/menu driven operator interface. It shall be possible to navigate through the system using a web browser to accomplish 2.2 B thru 2.2 J of this specification. The Web Browser GUI shall, as a minimum, provide a Navigation Pane for navigation and a Action Pane for display of animated graphics, schedules, alarms/events, live graphic programs, active graphic setpoint controls, configuration menus for operator access, reports and reporting actions for events.

B. On launching the web browser and selecting the appropriate domain name or IP address, the operator shall be presented with a login page that will require a login name and password. Navigation in the system shall be dependent on the operator's role privileges and geographic area of responsibility.

C. The Navigation Pane shall comprise a Navigation Tree which defines a geographic hierarchy of the proposed BAS system. Navigation through the GUI shall be accomplished by clicking on the appropriate level of a navigation tree (consisting of expandable and collapsible tree control like Microsoft's Explorer program) and/or by selecting dynamic links to other system graphics. Both the navigation tree and graphic pane defined herein shall be displayed simultaneously, enabling the operator to select a specific system or equipment and view the graphic corresponding to the highlighted position in the navigation tree. The navigation tree shall, as a minimum, provide the following views:

1. Geographic View shall display a logical geographic hierarchy of the system including cities, sites, buildings, building systems, floors, equipment and BACnet objects.
2. Network View shall display the hierarchy of the actual BACnet IP Intranet network. This can include Systems, Site, Networks, Routers, Half-Routers, Devices, Equipment and all the BACnet Objects in a device.
3. Groups View shall display Scheduled Groups and custom reports.
4. Configuration View shall display all the configuration categories (Operators, Schedule, Event, Reporting and Roles).

D. The Action Pane shall provide several functional views for each HVAC or mechanical/electrical subsystem specified. By clicking on a button, an operator shall be able to select the following system page, corresponding to the highlighted area/equipment in the navigation tree:

1. Using animated gifs or other graphical format suitable for display in a web browser, graphics shall include aerial building and campus views, color building floor-plans, equipment drawings of each individual piece of equipment with live variable statuses, active graphic setpoint controls, web content and other valid HTML elements. The data on each graphic page shall automatically refresh at a rate defined by the operator.
2. Properties shall include graphic controls and text for locking or overriding BACnet objects, demand strategies and any other valid data required for setup. Changes made to the properties pages shall require the operator to depress an 'accept/cancel' button.
3. Schedules shall be used to create, modify, edit and view schedules based on the systems geographical hierarchy, using the navigation tree.
4. Events shall be used to view alarm event information geographically using the navigation tree, acknowledge events, sort events by category, actions and verify reporting actions.
5. Trends shall be used to display associated trend and historical data, modify colors, date range, axis and scaling.

6. Live Graphic Programs shall be used to display a 'live' graphic program of the control algorithm for the mechanical/electrical system selected in the navigation tree. All control outputs and inputs shall be displayed on the program giving real-time statuses for use in operator troubleshooting.

E. The Web Browser GUI shall make extensive use of color in the graphic pane to communicate information related to setpoints and comfort. Animated gif's, active setpoint graphic controls and valid web content such as local weather forecast shall be used to enhance usability.

1. The GUI workstation software shall graphically display in 1024 by 768 pixels 24 bit True Color.
2. General area maps shall show locations of controlled buildings in relation to local landmarks.
3. Floor plan graphics shall show heating and cooling zones throughout the buildings in a range of colors which provide a visual display of temperature relative to their respective setpoints. The colors shall be updated dynamically as a zone's actual comfort condition changes in real-time. Locations of space sensors shall also be shown for each zone. The intent of this specification is to enable the operator to readily assess problems at a glance.
4. Mechanical system graphics shall show the type of mechanical system components serving any zone through the use of a pictorial representation of components. Selected I/O points being controlled or monitored for each piece of equipment shall be displayed with the appropriate engineering units. Animation shall be used for rotation or moving mechanical components to enhance usability.
5. Color graphics shall be selected and displayed via a web browser for the following:
   a. Each piece of equipment monitored or controlled [including each AHU, Boiler, Chiller, Pump and Energy Recovery Unit.]
   b. Each building.
   c. Each floor and zone controlled.

F. Color floor plans displayed via a web browser shall utilize a contiguous band of colors, each corresponding to actual zone temperatures relative to the desired heating and cooling setpoints. The ideal temperature shall be shown as a green color band. Temperatures slightly warmer than ideal shall be shown in yellow and even warmer temperature bands shall be shown in orange. Temperatures slightly cooler than ideal shall be light blue and even cooler temperatures shall be shown as dark blue. All alarm colors shall be in red.

G. Utilizing a mouse, it shall be possible to select occupied or unoccupied setpoints, corresponding to the floor plan colors, and drag the color slide bars to increase or decrease heating and cooling setpoints. In addition to the slide bars, an operator may type the numeric value of the heating and cooling setpoints. The floor plan graphic shall then change colors on a zone-by-zone basis to reflect the actual temperature in each zone relative to the changed heating or cooling setpoint.

H. Utilizing the Navigation Tree displayed in the web browser GUI an operator, with password access, shall be able to define a Normal, Holiday or Override schedule for an individual piece of equipment or room or choose to apply a hierarchical schedule to the entire system, site or floor area. All schedules that affect the system/area/equipment highlighted in the Navigation Tree shall be shown in a summary schedule table and graph.

1. BACnet Schedules: Schedules shall comply with the BACnet standard, (Schedule Object, Calendar Object, Weekly Schedule property and Exception Schedule property) and shall allow events to be scheduled based on:

a. Types of schedule such as be normal, holiday or override.
b. A specific date.
c. A range of dates.
d. Any combination of month of year (1-12, any), week of month (1-5, last, any), day of week (M-Sun, any).
e. Wildcard, for example to allow combinations such as second Tuesday of every month.

2. The system shall allow operators to define and edit scheduling categories for example, lighting, HVAC occupancy, etc. The categories shall include name, description, icon (to display in the hierarchy tree when icon option is selected) and type of value to be scheduled.
3. In addition to hierarchical scheduling, operators shall be able to define functional Schedule Groups, comprised of an arbitrary group of areas, rooms or equipment scattered throughout the facility and site. For example, the operator shall be able to define an 'individual tenant' group who may occupy different areas within a building or buildings. Schedules applied to the tenant group shall automatically be downloaded to control modules affecting spaces occupied by the tenant group
4. The control system shall be intelligent enough to automatically turn on any supporting equipment needed to control the environment in an occupied space. If the operator schedules an individual room in a VAV system for occupancy, the control logic shall automatically turn on the [VAV air handling unit, chiller, boiler,] and/or any other equipment required to maintain the specified comfort and environmental conditions within the room.
5. Schedule events shall be able to accommodate a time range specified by the operator.
6. The schedule summary graph shall clearly show normal versus holiday versus override schedules and the net operating schedule that results from all contributing schedules. In case of priority conflict between schedules at the different geographic hierarchy, the schedule for the more detailed geographic level shall apply.
7. For reliability and performance, instead of maintaining a single schedule in a field device that writes over the network to notify other devices when a scheduled event occurs, field devices shall only keep their part of the schedule locally. The BAS server software shall determine which nodes a hierarchical schedule applies to and shall create or modify the necessary schedule objects in each field device as necessary.

I. Events and alarms associated with a specific system, area or equipment selected in the Navigation Tree shall be displayed in the Action Pane by selecting an 'Events' view. Events, alarms and reporting actions shall have the following capabilities:

1. Each event shall display an Event Category (using a different icon for each event category) date/time of occurrence, current status, event report and a URL link to the associated graphic for the selected system, area or equipment. The URL link shall indicate the system location, address and other pertinent information. An operator shall easily be able to sort events, edit event templates and categories, acknowledge or force a return to normal in the Events View as specified herein.
2. The operator shall be able to create, edit or delete event categories such as HVAC, Maintenance, Fire or Generator. An icon shall be associated with each Event category, enabling the operator to easily sort through multiple events displayed using a built-in filter.
3. BACnet Event template shall define different types of alarms and their associated properties. As a minimum, properties shall include a reference name, verbose description, severity of event, acknowledgement requirements, high/low limit and out of range

information.

4. Event Areas shall enable an operator to assign specific Event Categories to specific Event Reporting Actions.
5. All events shall be generated at the DDC control module level and shall comprise the Time/Date Stamp using the standalone control module time and date.
6. Operators shall be able to define the type of events generated per BACnet object. A 'network' view of the Navigation Tree shall expose all BACnet objects and their respective Event Configuration. Configuration shall include assignment of event, alarm, type of Acknowledgement and notification for return to normal or fault status.
7. The view of events in the Graphic Pane shall provide a numeric counter, indicating how many events are active in alarm, require acknowledgement, and total number of events in the BAS Server database.
8. The system shall allow for external systems to access the event instance data. Event data shall be stored and queried in the database in a relational manner. At a minimum, the fields to be stored in the database shall be:
    a. Event Source.
    b. Event Generation Time.
    c. Acknowledge Required Flag.
    d. Delivery Priority.
    e. BACnet Event Type.
    f. Event Message Text.
    g. BACnet Event Parameter.
    h. Classification of Event.
    i. Event Acknowledgement Time.
    j. Return to Normal Time.
    k. Operator Comments.
    l. Who Acknowledged the Event.
9. Events that are acknowledged and closed shall be auto-deleted from the database and archived to a text file after an operator defined period.
10. Event Reporting Actions specified shall be automatically launched, under operator defined conditions, after an event is received by the BAS server software. Operators shall be able to fully define these Reporting Actions using the Navigation Tree and Graphic Pane in the web browser GUI. Reporting Actions shall be as follows:
    a. Alarm/Event information shall be printed to the BAS server's PC or a networked printer.
    b. Email shall be sent via any POP3-compatible e-mail server. Email messages may be copied to several email accounts. Email reporting action shall also be used to support alphanumeric paging services where email servers support pagers.
    c. The ASCII File write reporting action shall enable the operator to append operator defined alarm information to any alarm through a text file. The alarm information that is written to the file shall be completely definable by the operator. The operator may enter text or attach other data point information, such as air handling unit discharge temperature and fan condition upon a high room temperature alarm.
    d. The write property reporting action shall update a property value in a hardware module.
    e. The Simple Network Management Protocol (SNMP) reporting action shall send an SNMP trap to a network in response to receiving an event.
    f. The Run External Program reporting action shall launch specified program in response to an event.

11. The web browser GUI user shall provide an Event Simulator to test assigned Reporting Actions. The operator shall have the option of using current time or scheduling a specific time to generate the Event. Utilizing the Navigation Tree and drop-down menus in the Graphic Pane, the operator shall be able to select the Event Type, Status, Notification, Priority, Message and whether acknowledgement is required.
12. The BAS server software shall provide a CORBA interface for external injection of events, allowing the system to receive/report events generated from external source other than the BAS system.

J. Trends shall conform to the BACnet Trend Log Object specification. The system shall be able to trend and display graphically all analog, digital or calculated points simultaneously. A trend log's properties shall be editable using the Navigation Tree and Graphic Pane.

1. The operator shall have the ability to view trends by using the Navigation Tree and selecting a Trends button in the Graphic Pane. The system shall allow y- and x-axis maximum ranges to be specified and shall be able to simultaneously graphically display multiple trends per graph.
2. Trend data shall be collected locally by Multi-Equipment or Single Equipment general-purpose controllers and periodically uploaded to the BAS server if historical trending is enabled for the BACnet object. Trend data, including run time hours and start time date, shall be retained in non-volatile module memory
3. Sample intervals shall be as small as 0.1 second. Each trended point will have the ability to be trended at a different trend interval. When multiple points are selected for displays that have different trend intervals, the system shall automatically scale the axis.
4. Trends shall be able to dynamically update at operator-defined intervals.
5. It shall be possible to zoom in on a particular section of a trend for more detailed examination.
6. It shall be possible to pick any sample on a trend and have the numerical value displayed.

K. System shall have security access from the web browser GUI to BAS server and shall require a login name and password. Access to different areas of the BAS system shall be defined in terms of roles, privileges and geographic area of responsibility as specified:

1. Roles shall reflect the actual roles of different types of operators. Each role shall comprise a set of easily understood English language privileges. Roles shall be defined in terms of View, Edit and Function privileges. Systems that use cryptic Boolean numbers to define system access will not be acceptable.
   a. View Privileges shall comprise Navigation, Network, and Configuration Trees, Operators, Roles and Privileges, Alarm/Event Template and Reporting Action.
   b. Edit Privileges shall comprise Setpoint, Tuning and Logic, Manual Override and Point Assignment Parameters.
   c. Function Privileges shall comprise Alarm/Event Acknowledgement, Control Module Memory Download, Upload, Schedules, Schedule Groups, Manual Commands, Print and Alarm/Event Maintenance.
2. Roles shall be geographically assigned using a similar expandable and collapsible navigation tree.

2.03 GRAPHICAL PROGRAMMING:

A. The system software shall include a Graphic Programming Language (GPL) for all DDC control algorithms resident in standalone control modules. Any system that does not use a drag and drop method of graphical icon programming as described herein will not be acceptable. GPL is a

method used to create a sequence of operations by assembling graphic microblocks that represent each of the commands or functions necessary to complete a control sequence of operation. Microblocks represent common logical control devices used in conventional control systems, such as relays, switches, high signal selectors, etc., in addition to the more complex DDC and energy management strategies such as PID loops and optimum start. Each microblock shall be interactive and contain the programming necessary to execute the function of the device it represents.

B. Graphic programming shall be performed while on screen and using a mouse. Each microblock shall be selected from a microblock library and assembled with other microblocks necessary to complete the specified sequence. Microblocks shall then be interconnected on screen using graphic "wires," each forming a logical connection. Once assembled, each logical grouping of microblocks and their interconnecting wires shall form a graphic function block which may be used to control any piece of equipment with a similar point configuration and sequence of operation.

C. The clarity of the graphic sequence shall be such that the operator has the ability to verify that system programming meets the specifications without having to learn or interpret a manufacturer's unique programming language. The graphic programming shall be self-documenting and provide the operator with an understandable and exact representation of each sequence of operation.

D. Full simulation capability shall be provided with the graphic programming. The operator shall be able to fully simulate the constructed control sequence prior to downloading into field control modules. Simulation capabilities shall include step-by-step, accelerated time and operator defined simulation criteria such as outside weather, demand and communication status. Multiple graphic programs shall be simulated and displayed in split screens at the same time.

E. The following shall be a minimum definition of the capabilities of the Graphic Programming software:

1. Function Block (FB) shall be a collection of points, microblocks and wires which have been connected together for the specific purpose of controlling a piece of HVAC equipment or a single mechanical system.
2. Input/Output points shall interface with the control modules in order to read various signals and/or values or to transmit signal or values to controlled devices.
3. BACnet Points shall be points that comply with the BACnet structure as defined in the BIBB’s Addendum B1/B2 and the BACnet standard.
4. Microblocks shall be software devices that are represented graphically and that may be connected together to perform a specified sequence. A library of microblocks shall be submitted.
5. Wires shall be graphical elements used to form logical connections between microblocks and between logical I/O. Different wire types shall be used depending on whether the signal they conduct is analog or digital.
6. Labels shall be similar to wires in that they shall be used to form logical connections between two points. Labels shall form a connection by reference instead of a visual connection for example, two points labeled 'A' on a drawing shall be logically connected even though there is no wire between them.
7. A parameter shall be a value that may be tied to the input of a microblock.
8. Dialog boxes shall appear after a microblock has been inserted which has editable parameters associated with it. Default parameter dialog boxes shall contain various editable and non-editable fields and shall contain 'push buttons’ for the purpose of selecting default parameter settings.

9. An icon shall be graphic representation of a software program. Each graphic microblock shall have an icon associated with it that graphically describes it function.
10. Menu-bar Icon shall be an icon that is displayed on the menu bar on the GPL screen which represents its associated graphic microblock.
11. The Graphic Programming software shall support a 'live' mode, where all input/output data, calculated data and setpoints shall be displayed in a 'live' real-time mode. For each piece of HVAC equipment, the graphic program shall be complete and viewed on one screen. For example, a graphic program used for an air handling unit shall not be broken down into separate components and shall require an operator to view only one component at any one time.

2.04 SYSTEM HARDWARE:

A. Provide a server configuration that includes the following components as a minimum:

1. 550Mhz, PIII or higher CPU, or non-Intel platform equivalent to this.
2. 128Mb of RAM minimum.
3. 8 gigabyte hard disk, 1.44M 3 ½" floppy drive, SVGA Card with 1024 x 768, 24-bit True Color, Iomega 100MB Zip Drive or Back-up system of customer's choice, 24X CD ROM Drive, 17" SVGA Color Monitor, Keyboard and mouse, 56Kbps EIA-232C Modem with automatic answer/originate capability.
4. Operating system for the computer operator workstation server shall be Microsoft Windows 98 or higher or RedHat Linux 6.0 or Sun Solaris 7.0.
5. Internet Explorer 5.x or Netscape 5.x.
6. 10Base-T Ethernet Port.
7. Color printer capable of providing letter-quality print. For reporting alarms, a printer capable of handling fanfold paper is desirable.

B. The thin-client browser interface shall be hardware agnostic, meaning it will support Microsoft and Netscape Navigator browsers (5.x versions) as well as most common server platforms such as Windows NT, Sun Solaris and Linux. No special software such as active-x components or fat Java clients shall be required to be installed on the PC's/PDA's used to access the BAS via a web browser. The following is the minimum suggested hardware requirements for a Windows/Intel client:

1. 500Mhz, PIII or higher CPU, or non-Intel platform equivalent to this.
2. 128Mb of RAM minimum.
3. 6 gigabyte hard disk, 1.44M 3 ½" floppy drive, SVGA Card with 1024 x 768, 24-bit True Color, 24X CD ROM Drive, 17" SVGA Color Monitor.
4. Operating system for the computer operator workstation server shall be Microsoft Windows 98, NT 4.0, 2000 or RedHat Linux 6.0 or Sun Solaris 7.0.
5. Internet Explorer 5.0 or Netscape 5.0.
6. Connection to the Intranet/Internet.

C. No client hardware shall be required if the BAS server can act as client in addition to the BAS server applications. Any owner/customer computers may act as client if the client computer has a 5.X browser and has connection capability to the DDC intranet/server.

2.05 NETWORK ROUTERS & BRIDGES:

A. The DDC/BAS controller network shall use BACnet as its native communication protocol. Network bridges and routers shall be of a modular design to ensure reliability and system

performance.

B. The central system shall use the DDC/BAS Local Area Network (LAN) provided under this contract for communication. The communication between the central server and the controllers shall be BACnet/IP. A router shall be provided, as required, to bridge BACnet/IP and the data link used between the controllers (BACnet ARCNET and BACnet MS/TP). Proprietary networks and proprietary protocols will not be acceptable. BACnet Routers shall use BACnet as the native communication protocol and shall, as a minimum, support the following BIBBS:

Data Sharing	Alarm Event	Schedule	Trend	Device Man	Network Man
DS-RP-A,B	AE-N-B	SCHED-B	T-VMT-B	DM-DDB-A,B	NM-RC-A
DS-RPM-B	AE-ACK-B		T-ATR-B	DM-DOB-A,B	
DS-WP-A,B	AE-ASUM-B			DM-DCC-B	
DS-WPM-B					
DS-COVU-A,B					

C. The BACnet Router shall utilize FLASH memory to allow firmware updates to be performed remotely.

2.06 STANDALONE CONTROLLERS:

A. General Purpose Multiple Application controllers shall use BACnet as the native communication protocol between controllers and shall, as a minimum, support the following BIBBS:

Data Sharing	Alarm Event	Schedule	Trend	Device Man.
DS-RP-A,B	AE-N-B	SCHED-B	T-VMT-B	DM-DDB-A,
DS-RPM-B	AE-ACK-B		T-ATR-B	DM-DOB-B
DS-WP-A,B	AE-ASUM-B			DM-DCC-B
DS-WPM-B				DM-TS-B
DS-COVU-A,B				DM-UTC-B
				DM-RD-B

1. Controllers shall communicate at a minimum of 156 Kbps using ARCNET implemented over EIA-485 using an unshielded twisted pair at the Data Link Layer.
2. Each General Purpose Multiple Application Controller shall be capable of standalone direct digital operation utilizing its own 32 bit processor, non-volatile flash memory, input/output, 12 bit A to D conversion, hardware clock/calendar and voltage transient and lightning protection devices. A separate co-processor shall be used for communications to the controller network. All non-volatile flash memory shall have a battery backup of at least five years. Firmware revisions to the module shall be made from the BAS server or remotely over the Intranet or Internet. Controllers that require component changes to implement firmware revisions are not acceptable.
3. The General Purpose Multiple Application Controllers shall be expandable to the specified I/O point requirements. Each controller shall accommodate multiple I/O Expander Modules via a designated expansion I/O bus port. These expander modules shall expand the total point capacity of each controller up to 192 points where specified. The controller, in conjunction with the expansion modules, shall act as one standalone controller.
4. All point data, algorithms and application software within a controller shall be custom programmable from the operator workstation.

5. Each General Purpose Multiple Application Controller shall execute application programs, calculations, and commands via a 32-bit microcomputer resident in the controller. All operating parameters for application programs residing in each controller shall be stored in read/writ able nonvolatile flash memory within the controller and will be able to upload/download to/from the BAS Server.
6. Each controller shall include self-test diagnostics, enabling the controller to report malfunctions to the router and BAS Server.
7. Each General Purpose Multiple Application Controller shall contain both software and firmware to perform full DDC Proportional, Integral, Derivative (PID) control loops and programs.
8. Input-Output Processing:
   a. Digital Outputs shall be relays, 24 Volts AC or DC maximum, 3-amp maximum current. Each configured as normally open or normally closed using jumpers and either dry contact or bussed. Each output shall have a manual Hand-Off-Auto switch to allow for override and an LED to indicate the operating mode of the output. Triac outputs are unacceptable.
   b. Universal Inputs shall be Thermistor (BAPI Curve II) 10K Ohm at 77F (25C), 0-5VDC, 10K Ohm maximum source impedance, 0-20mA - 24 VDC loop power, 250 Ohm input impedance, dry contact - 0.5mA maximum current.
   c. Analog Output shall be electronic, voltage mode 0-10VDC or current mode 4-20mA.

B. The General Purpose Single Application Controllers shall use BACnet as the native communication protocol between controllers and shall, as a minimum, support the following BIBBS:

Data Sharing	Alarm Event Schedule	Trend	Device Man
DS-RP-A, B	AE-N-B SCHED-B	T-VMT-B	DM-DDB-A,B
DS-RPM-B	AE-ACK-B	T-ATR-B	DM-DOB-B
DS-WP-A,B	AE-ASUM-B		DM-DCC-B
DS-WPM-B			DM-TS-B
DS-COVU-A,B			DM-UTC-B
			DM-RD-B

1. Controllers shall communicate at a minimum of 156 Kbps using ARCNET implemented over EIA-485 using an unshielded twisted pair at the Data Link Layer.
2. General Purpose Single Application controllers shall be capable of stand-alone DDC operation utilizing their own 32 bit processor, nonvolatile flash memory, input/output, 8 bit A to D conversion, hardware clock/calendar and voltage transient protection devices. A separate co-processor shall be used for communications to the controller network. All RAM memory shall have a battery backup of at least five years. Firmware revisions to the module shall be made from the BAS server or remote locations over the Internet. Controllers that require component changes to implement Firmware revisions will not be acceptable.
3. All point data, algorithms and application software within the controllers shall be custom programmable from the Operator Workstation.
4. Each General Purpose Single Application Controller shall execute application programs, calculations and commands via a 32-bit microcomputer resident in the controller. All operating parameters for the application program residing in each controller shall be stored in read/writeable nonvolatile flash memory within the controller and shall be able to be uploaded or downloaded to/from the Operator Workstation.

5. Each controller shall include self-test diagnostics enabling the controller to report malfunctions to the router and BAS Server input.
6. Each General Purpose Single Application Controller shall contain both software and firmware to perform full DDC PID control loops.
7. The General Purpose Single Application Controllers shall be capable of being mounted directly in or on rooftop equipment.
8. The General Purpose Single Application Controllers shall be capable of proper operation in an ambient temperature environment of -20F to +150F (-28.9 to 65.6C).
9. Input-Output Processing:
    a. Digital Outputs shall be relays, 24 Volts AC or DC maximum, 3 amp maximum current. Each output shall have a manual Hand-Off-Auto switch to allow for override and an LED to indicate the operating mode of the output. Triac outputs will not be unacceptable.
    b. Universal Inputs shall be Thermistor (BAPI Curve II) 10K Ohm at 77F (25C), 0-5VDC - 10K Ohm maximum source impedance, 0-20mA - 24 VDC loop power, 250 Ohm input impedance, Dry Contact, 0.5mA maximum current.
    c. Analog Electronic Outputs shall be voltage mode 0-10VDC or current mode 4-20mA.
    d. Enhanced Zone Sensor Input shall provide one thermistor input, one local setpoint adjustment, one timed local override switch and an occupancy LED indicator.

C. The Unitary Controllers shall use BACnet as the native communications protocol between controllers on the unitary controller network and shall, as a minimum, support the following BIBBS:

Data Sharing	Device Man
DS-RP-B	DM-RD-B
DS-WP-B	DM-PT-B

1. The communication between unitary controllers shall be 38.4 Kbps minimum over EIA-485 using an MS/TP architecture.
2. Each Unitary Controller shall be able to support various types of zone temperature sensors such as temperature sensor only, temperature sensor with built-in local override switch and temperature sensor with built-in setpoint adjustment switch.
[3. In order to provide reliable Pressure Independent VAV operation, Unitary Controllers for pressure independent VAV applications shall have a precision built-in Honeywell AWM series airflow transducer for accurate air flow measurement.]
[4. Each Unitary Controller for VAV applications shall have an integral direct coupled electronic actuator with the following features:
    a. The actuator shall provide on-off/floating point control with a minimum of 35 in-lb of torque.
    b. The assembly shall mount directly to the damper operating shaft with a universal V-Bolt clamp assembly.
    c. The actuator shall not require any limit switches and shall be electronically protected against overload.
    d. The actuator shall automatically stop when reaching the damper or actuator end position.
    e. The gears shall be capable of being manually disengaged with a button on the assembly cover.
    f. A visual pointer for the position of the actuator.

g. The assembly shall have an anti-rotational strap supplied with the assembly that will prevent lateral movement.
h. 5-year warranty from the manufacturer.]

5. Each Unitary Controller and Unitary Controller Interface shall have LED indication for visual status of communication, power, and all outputs.
6. In the event of a loss of communication, each Unitary Controller shall control from a standalone algorithm, which shall maintain the assigned space temperature until communication with the Unitary Control Module Interface is restored.
7. Input/Output Processing:
   a. Digital outputs shall be relays, 24 Volts AC or DC maximum, having a 1 Amp maximum current. Each relay shall be configured as normally open or normally closed and either dry contact or bussed. Triac outputs will not be acceptable.
   b. Universal inputs shall be Thermistor Precon Type II, dry contacts or 0-5VDC with 0-10K Ohm input impedance.
   c. Enhanced Zone Sensor Input. The input shall provide one thermistor input, one local setpoint adjustment, one timed local override switch and an occupancy LED indicator.
   d. Analog output electronic, voltage mode 0-10VDC or current mode 4-20mA.

2.07 BUILDING SYSTEMS INTEGRATION:

A. The BAS shall establish a seamless interconnection with other building, electrical and/or mechanical subsystems as well as other manufacturers control systems as specified below [including the variable volume and temperature (VVT) systems specified in Section 15895, VVT Systems and Controls]. These systems shall be controlled, monitored and graphically programmed with the same Graphical Programming Language (GPL) used for all other control modules.

B. All system information specified and related documents shall be available to the BAS server.

C. Full cooperation by the Original Equipment Manufacturer (OEM) in this open protocol effort shall be required. OEM manufacturers shall bid BACnet. OEM manufacturers that utilize other protocols shall include the cost of a BPT in their bid. If the OEM manufacturer uses the LonWorks protocol, they shall certify their devices are LonMark compliant and comply with the requirements of this specification.

D. If the equipment manufacturer does not have this capability, they shall contact the authorized representative of the BAS for assistance and shall include in their equipment price any necessary equipment obtained from the BAS manufacturer to comply with this section.

E. BPT Specification:

1. The BPT shall be a microprocessor based communication device designed to provide seamless, two-way translation between two or more standard or non-standard protocols.
2. The BPT shall be available for a variety of Data Link\Physical Layer configurations including PTP (point-to-point) via EIA-232, MS/TP via EIA-485, and ARCNET.
3. In addition to BACnet, the BPT shall also support other protocols including Modbus, J-Bus and other protocols as specified herein for electrical and mechanical subsystems.
4. The BPT shall have at least three communication ports. One shall be for communication between native BACnet controllers residing on the controller network. The other two ports shall have the ability to be configured for different protocols.
5. The BPT shall provide full custom programmability of the data flowing between the networks using the same graphical programming as specified herein. The system shall

have the ability to create custom building control strategies using global data between networks.

2.08 FIELD HARDWARE/INSTRUMENTATION:

A. Temperature Sensing Devices:

1. Temperature sensors shall be of the type and accuracy indicated for the application. Sensors shall have an accuracy rating within 1% of the intended use temperature range.
2. Outside air temperature sensors' accuracy shall be within +1F (0.5C) in the range of -52F to 152F (-46.6C to 66.6C).
3. Room temperature sensors shall have an accuracy of +0.36F (0.25C) in the range of 32F to 96F (0C to 35.5C).
4. Chilled water and condenser water sensors shall have an accuracy of +0.25F (0.15C) in their range of application.
5. Hot water temperature sensors shall have an accuracy of +0.75F (0.3C) over the range of their application.

B. Pressure Instruments:

1. Differential Pressure and Pressure Sensors shall have a 4-20 MA output proportional signal with provisions for field checking. Sensors shall withstand up to 150% of rated pressure without damaging the device. Accuracy shall be within $\pm$2% of full scale. Sensors shall be manufactured by Leeds & Northrup, Setra, Robertshaw, Dwyer Instruments or Rosemont.
2. Pressure switches shall have a repetitive accuracy of $\pm$ 2% of range and withstand up to 150% of rated pressure. Sensors shall be diaphragm or bourdon tube design. Switch operation shall be adjustable over the operating pressure range. The switch shall have an application rated Form C, snap-acting, self-wiping contact of platinum alloy, silver alloy or gold plating.

C. Flow switches shall have a repetitive accuracy of $\pm$1% of their operating range. Switch actuation shall be adjustable over the operating flow range. Switches shall have snap-acting Form C contacts rated for the specific electrical application.

D. Humidity Sensors shall have an accuracy of $\pm$25% over a range of 20% to 95% RH.

E. Current Sensing Relays shall monitor status of motor loads. Switch shall have self-wiping, snap-acting Form C contacts rated for the application. The setpoint of the contact operation shall be field adjustable.

F. Output Relays shall be rated for 150% of the loading application, with self-wiping, snap-acting Form C contacts, enclosed in dustproof enclosure. Relays shall have silver cadmium contacts with a minimum life span rating of one million operations. Relays shall be equipped with coil transient suppression devices.

G. Solid State Relays. Input/output isolation shall be greater than 10 billion ohms with a breakdown voltage of 15 V root mean square, or greater, at 60 Hz. The contact operating life shall be 10 million operations or greater. The ambient temperature range of SSRs shall be 20°F to 140°F. Input impedance shall be greater than 500 ohms. Relays shall be rated for the application. Operating and release time shall be 10 milliseconds or less. Transient suppression shall be provided as an integral part of the relays.

H. Valve and Damper Actuators:

1. Electronic direct-coupled actuators shall be provided.
2. Each actuator shall be direct-coupled over the shaft, enabling it to be mounted directly to the damper shaft without the need for connecting linkage. The fastening clamp assemble shall be of a 'V' bolt design with associated 'V' shaped toothed cradle attaching to the shaft. Spring return actuators shall have a 'V' clamp assembly of sufficient size to be directly mounted to an integral jackshaft of up to 1.05 inches when the damper is constructed in this manner. Single bolt or screw type fasteners will not be acceptable
3. Each actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the entire rotation of the actuator. Mechanical end switches or magnetic clutch to deactivate the actuator at the end of rotation will not be acceptable.
4. For power failure and safety applications, an internal mechanical spring return mechanism shall be built into the actuator housing. Non-mechanical forms of fail-safe operation will not be acceptable.
5. All spring return actuators shall be capable of both clockwise and counterclockwise spring return operation by simply changing the mounting orientation.
6. Proportional actuators shall accept a 0 to 10VDC or 0 to 20mA control input and shall provide a 2 to 10VDC or 4 to 20mA operating range. An actuator capable of accepting a pulse width modulating control signal and providing full proportional operation of the damper is acceptable. All actuators shall provide a 2 to 10VDC position feedback signal.
7. All 24VAC/DC actuators shall operate on Class 2 wiring and shall not require more than 10VA for AC or more than 8 watts for DC applications. Actuators operating on 120VAC power shall not require more than 10VA. Actuators operating on 230VAC shall not require more than 11VA.
8. All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-lb torque shall have a manual crank for this purpose.
9. All modulating actuators shall have an external, built-in switch to allow reversing direction of rotation.
10. Actuators shall be provided with a conduit fitting and a minimum 3ft electrical cable and shall be pre-wired.
11. Actuators shall be Underwriters Laboratories Standard 873 listed and Canadian Standards Association Class 4813 02 certified as meeting correct safety requirements and recognized industry standards.
12. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque and shall have a 2-year manufacturer's warranty, starting from the date of installation. Manufacturer shall be ISO9001 certified.

I. Control Valves: Provide factory fabricated U.S. forged and assembled electric control valves of type, body material and pressure class indicated. Where type or body material is not indicated, provide selection as determined by manufacturer for installation requirements and pressure class based on maximum pressure and temperature in piping system. Provide valve sizes in accordance with scheduled or specified maximum pressure drop across control valve. Except as otherwise indicated, provide valves which mate and match material of connecting piping. Equip control valves with control valve motor actuators with proper shutoff rating for each individual application.

1. Water Service Valves: Equal percentage characteristics with rangeability of 50 to 1, Class 150 at 250°F and maximum full flow pressure drop 5 psig. Globe type with replaceable plugs and seats of stainless steel or brass. Select operators to close valves against pump

shutoff head.

[2. Steam Service Valves: Linear characteristics with rangeability to 30 to 1, and maximum full flow pressure drop of 80% of inlet pressure for low pressure systems, and 42% for high pressure. Class 150 at 250°F valve with replaceable plugs and seats of stainless steel.]

3. Double Seated Valves: Balanced plug type with caged type trim providing seating and guiding surfaces on top and bottom guided plugs.
4. Valve Trim and Stems: Polished stainless steel.
5. Packing: Spring-loaded Teflon, self-adjusting.

[6. Terminal Unit Control Valves: Provide control ball valves for control of terminal units including, but not necessarily limited to, convectors, fin-tube radiation and fan coil units that are of integral motor type. Provide 2-position or modulating type valves, electrically actuated by line voltage or by 24VAC.]

J. Control Dampers: Provide automatic control low leakage, opposed blade dampers with damper frames not less than formed 13-gauged galvanized steel. Provide mounting holes for enclosed duct mounting. Provide damper blades not less than formed 16-gauged galvanized steel with maximum blade width of 8 inches. Equip dampers with motors of proper rating of each application.

1. Secure blades to 1/2 inch diameter zinc-plated axles using zinc-plated hardware. Seal off against spring stainless steel blade bearings. Provide nylon blade bearings and provide thrust bearings at each end of every blade. Construct blade linkage hardware of zinc-plated steel and brass. Submit leakage and flow characteristics plus size schedule for controlled dampers.
2. Operating Temperature Range: From –20° to 200°F (-29° to 93°C).
3. For low leakage application or opposed blade design, as selected by manufacturers sizing techniques, provide inflatable steel blade edging or replaceable rubber seals rated for leakage less than 10 cfm per square foot of damper area, at a differential pressure of 4 inches w.g. when damper is being held by a torque of 50 inch-pounds.

[4. Provide unit ventilator outside air dampers with adjustable minimum settings so that ventilation can be adjusted for each space or room.]

2.09 DDC SOFTWARE:

A. The BAS shall continuously perform Direct Digital Control (DDC) functions at the local control module in a stand-alone mode. The operator shall be able to design and modify the control loops to meet the requirements of the system being operated. The operators shall use system provided displays for tuning of PID loops. These displays shall include the past three input variable values, the setpoint for the loop as well as the sample interval and the results of the proportional, integral and derivative effects on the final output.

B. Each control module shall perform the following functions:

1. Identify and report alarm conditions.
2. Execute all application programs indicated on the I/O Summary table.
3. Execute DDC algorithms.
4. Trend and store data.

C. In the event of a control module failure, all points under its control shall be commanded to the failure mode [as indicated on the I/O Summary Table]. All DDC software shall reside in the respective control module.

1. Power failures shall cause the control module to go into an orderly shutdown with no loss of program memory.
2. Upon resumption of power, the control module shall automatically restart and print out the time and date of the power failure and restoration at the respective Workstation system.
3. The restart program shall automatically restart affected field equipment. The operator shall be able to define an automatic power up time delay for each piece of equipment under control.

2.10 APPLICATIONS SOFTWARE:

A. Time of Day Scheduling (TOD). The system shall be capable of the following scheduling features:

1. Scheduling by building, area, zone, groups of zones, individually controlled equipment and groups of individually controlled equipment. Each schedule shall provide beginning and ending dates and times in hours and minutes. A weekly repeating schedule, i.e. between 8:00 a.m. and 5:00 p.m., Monday through Friday shall constitute one schedule, not five.
2. Dated schedules shall be entered up to nine years in advance.
3. Schedules shall be self-deleting when effective dates have passed.
4. Leap years shall be adjusted automatically without operator intervention.

B. Optimum Start/Stop (OSS)/Optimum Enable/Disable (OED). This application shall provide software to start and stop equipment on a sliding schedule based on the individual zone temperature and the heating/cooling capacity in °F/hour of the equipment serving that zone. The heating/cooling capacity value shall be operator adjustable. Temperature compensated peak demand limiting shall remain in effect during morning start up to avoid setting a demand peak. This application shall include Adaptive Learning which shall offer the ability to disable optimum start a definable time before occupied start, and which can also be disabled during an override situation.

C. Source Temperature Optimization (STO). The system shall automatically perform source optimization for all air handling units, chillers and boilers in response to the needs of other downstream pieces of equipment, by increasing or decreasing supply temperature setpoints, [such as chilled water, discharge air, etc.] using owner defined parameters. In addition to optimization, the STO capability shall provide for starting and stopping primary mechanical equipment based on zone occupancy and/or zone load conditions.

1. The STO program shall allow setpoints for various equipment in the heating/cooling chain to be reset between an operator defined maximum and a minimum setpoint based on the actual requirements of the building zones.
2. The actual setpoint shall be calculated based on the number of heating or cooling requests which are currently being received from the equipment or zones served. Once every update period, the STO program shall survey the network to see if any piece of equipment requires any additional heating or cooling from its source. [As an example, a VAV air handler would be the source of cold air for a number of VAV boxes.]

D. Demand Limiting (DL), Temperature Compensated. The DL application shall be programmable for a minimum of six separate time of day KW demand billing rate periods. The system shall be capable of measuring electrical usage from multiple meters serving one building and each piece of equipment being controlled on the LAN shall be programmable to respond to the peak demand information from its respective meter.

1. The demand control function shall utilize a sliding window method with the operator being able to establish the kilowatt threshold for a minimum of three adjustable demand levels. The sliding window interval shall be operator selectable in increments of one minute, up to 60 minutes. Systems that incorporate rotating shed tables will not be acceptable.
2. The operator shall have the capability to set the individual equipment temperature setpoints for each operator defined demand level. Equipment shall not be shed if these reset setpoints are not satisfied. Rather, the setpoint shall be revised for the different established demand levels. The system shall have failed meter protection such that when a Kw pulse is not received from the utility within an operator adjustable time period, an alarm will be generated. The system software shall automatically default to a predetermined fail-safe shed level.
3. The system shall have the ability to archive demand and usage information for use at a later time. System shall permit the operator access to this information on a current day, month to date and a year to date basis.

E. Day/Night Setback (DNS). The system shall allow the space temperature to drift down [up] within a preset [adjustable] unoccupied temperature range. The heating [cooling] shall be activated upon reaching either end of the DNS range and shall remain activated until the space temperature returns to the DNS range.

1. The system shall be capable of closing all outside air and exhaust air dampers during the unoccupied period, [except for 100% outside air units.]
2. Unoccupied space temperature shall be monitored by the DDC temperature sensors located in the individual zones being controlled or within a representative room.
3. The operator shall be able to define, modify or delete the following parameters.
   a. DNS setpoint temperatures.
   b. Temperature band for night heating operation.
   c. Period when the DNS is to be activated.

F. Timed Local Override (TLO). The system shall have TLO input points that permit the occupants to request an override of equipment that has been scheduled OFF. The system shall turn the equipment ON upon receiving a request from the local input device. Local input devices shall be push button (momentary contact), wind-up timer, or ON/OFF switches [as detailed in the I/O summary].

1. If a push button is used the system operator shall be able to define the duration of equipment ON time per input pulse and the total maximum ON time permitted. The input point shall cancel override time already entered.
2. If a wind-up timer is used the equipment shall stay in override mode until the timer expires. Year to date, month-to-date and current day override history shall be maintained for each TLO input point.
3. History data shall be accessible by the operator at any time and shall be capable of being automatically stored on hard disk and/or printed on a daily basis.

G. Space Temperature Control (STC). There shall be two space temperature setpoints, one for cooling and one for heating, separated by a dead band. Only one of the two setpoints shall be operative at any time. The cooling setpoint shall be operative if the actual space temperature has more recently been equal to or greater than the cooling setpoint. The heating setpoint shall be operative if the actual space temperature has more recently been equal to or less than the heating setpoint. There shall be two modes of operation for the setpoints, one for the occupied mode and one for the unoccupied mode.

1. The occupied/unoccupied modes may be scheduled by time, date, or day of week.
2. One of seven colors shall be generated to represent the comfort conditions in the space and shall be displayed graphically at the operator station.
    a. If the actual space temperature is in the dead band between the heating setpoint and the cooling setpoint, the color displayed shall be green for the occupied mode representing ideal comfort conditions. If in the unoccupied mode, the color displayed shall be gray representing after hours conditions.
    b. If the space temperature rises above the cooling setpoint, the color shall change to yellow. Upon further rise beyond the cooling setpoint plus an offset, the color shall change to orange. Upon further rise beyond the cooling setpoint plus the yellow band offset, plus the orange band offset, the color shall change to red indicating unacceptable high temperature conditions. At this point an alarm shall be generated to notify the operator.
    c. When space temperature falls below the heating setpoint, the color shall change to light blue. Upon further temperature decrease below the heating setpoint minus an offset, the color shall change to dark blue. Upon further space temperature decrease below the heating setpoint minus the light blue band offset minus the dark blue band offset, the color shall change to red indicating unacceptable low temperature conditions. At this point an alarm shall be generated to notify the operator.
3. All setpoints and offsets shall be operator definable. When in the occupied mode, start-up mode, or when heating or cooling during the night setback unoccupied mode, a request shall be sent over the network to other equipment in the HVAC chain, such as to an air handling unit fan that serves the space to run for ventilation. The operator shall be able to disable this request function if desired.
4. When comfort conditions are warmer than ideal, indicated by the colors yellow, orange and high temperature red, a request for additional cooling shall be sent over the network to other cooling equipment in the HVAC chain, [such as a chiller]. This information shall be used for optimization of equipment in the HVAC chain. The operator shall be able to disable this function if desired.
5. When comfort conditions are cooler than ideal, indicated by the colors light blue, dark blue and low temperature red, a request for additional heating shall be sent over the network to other heating equipment in the HVAC chain, [such as a boiler]. This information shall be used for optimization of equipment in the HVAC chain. The operator shall be able to disable this function if desired.
6. The cooling and heating setpoints may be increased or decreased under demand control conditions to reduce the cooling and heating load on the building during the demand control period. Up to three levels of demand control strategy shall be provided. The operator may predefine the amount of setpoint increase or decrease for each of the three levels. Each space temperature sensor in the building shall be capable of being be programmed independently.
7. An optimum start-up program shall transition from the unoccupied setpoints to the occupied setpoints. The optimum start-up algorithm shall consider the rate of space temperature rise for heating and the rate of space temperature fall for cooling under nominal outside temperature conditions. It shall consider the outside temperature and the heat loss and gain coefficients of the space envelope.
8. A PID control loop, comparing the actual space temperature to its setpoint, shall modulate the dampers [and heating coil valve or heating stages in sequence] to achieve the setpoint target.

H. Adaptive Learning shall be the ability to disable optimum start a definable time before occupied start, and which can be disabled during override.

I. Variable volume and temperature (VVT) systems:

1. Refer to Section 15895 [23 09 35], VVT Systems and Controls, for the required interface between the space temperature controls specified therein and the BAS.
2. The BAS shall be capable of remote monitoring of both space temperature and space temperature set-point in those spaces under the control of the VVT systems. This information shall be displayed graphically at the operator work station for integration into the overall building space temperature monitoring and alarm graphics specified herein.]

PART 3 - EXECUTION

3.01 HARDWARE INSTALLATION:

A. Utility company equipment. Owner shall arrange installation of electric billing meters with demand signal pulses, [as indicated on the I/O Summary Table].

B. Wiring:

1. Install wires for the room temperature sensors, from sensor to the appropriate control module.
2. Install all sensing devices and the wiring to modules.
3. Install all control and monitoring wiring in the mechanical room.
4. Low voltage wire shall be not less than 18 AWG. All line voltage wire shall be THHN/TFFN, 600 volt rated.
5. All line voltage wire shall be run in conduit (EMT). All exposed wiring shall be run in conduit. Wire run in hollow walls and in accessible concealed areas may be run without conduit. Accessible concealed wire run in return air plenums shall meet NEC 725 (b) code.

C. Mount all room temperature sensors on the wall at the same height above the floor as the light switches. Refer to the electrical drawings and specifications.

3.02 SEQUENCES OF OPERATION:

END OF SECTION 230923

SECTION 230933
AUTOMATIC TEMPERATURE CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 230000, Mechanical General, apply to all work specified in this section.

1.2 QUALITY ASSURANCE:

A. Furnish and install a system of electric/pneumatic automatic temperature controls for the HVAC systems at Myers Hall and at the Pettigrew Center, as specified herein and as shown on the drawings.

B. The control components to be furnished on this project shall be compatible in all respects with the existing controls installations at each building and shall be installed and commissioned by installers that are qualified to do so. Controls components manufactured by Barber-Colman, Honeywell, Johnson Controls or Siemens will be acceptable provided that there are compatible with the existing installations.

PART 2 - PRODUCTS

2.1 CONTROL VALVES:

A. Provide factory fabricated forged and assembled electric control valves of type, body material and pressure class indicated. Where type or body material is not indicated, provide selection as determined by manufacturer for installation requirements and pressure class, based on maximum pressure and temperature in the piping system. Provide valve size in accordance with scheduled or specified maximum pressure drop across control valve. Except as otherwise indicated, provide valves which mate and match material of connecting piping. Equip control valves with pneumatic actuators unless indicated otherwise.

1. Water service valves shall have equal percentage characteristics with rangeability of 50 to 1, Class 150 at 250°F and maximum full flow pressure drop 5 psig. Provide globe type valves with replaceable plugs and seats of stainless steel or brass. Select operators to close valves against pump shutoff head.
2. Valve trim and stems: Polished stainless steel.
3. Packing: Spring-loaded Teflon, self-adjusting.

2.2 VALVE ACTUATORS:

A. Valve actuators shall be of the molded synthetic rubber diaphragm type, spring return, fail safe in either normally open or normally closed position as dictated by freeze, humidity or temperature protection.

B. Actuators shall fail to the safe position as indicated on the drawings.

C. Actuators shall be permanently lubricated; gear-train units shall be oil-immersed type. Actuator housings shall be of sturdy metal construction, plastic housings will not be acceptable. Ambient temperature range shall be at least 40º to 120º F, except actuators subjected to outdoor ambient conditions shall have ambient range of -20º to 130º F minimum. Actuator size and rating shall be suitable for intended application.

D. Positive positioners shall be provided on valve actuators to provide smooth modulation or proper sequencing.

1. Positioner start-point shall be adjustable (or selectable).
2. Positioner span shall be adjustable, or at least three fixed spans for sequencing applications shall be available.

2.3 CONTROL PANELS:

A. All controllers, relays, switches, transducers, etc. shall be mounted in enclosed control panels with hinged locking doors. Indicating devices and switches shall be mounted on the face of the control panel doors. All control devices, including indicators, for equipment located in exposed areas subject to outside weather conditions, shall be mounted inside weatherproof enclosures. Location of each panel shall be convenient for adjustment service or adjacent to existing control panels. Name plates shall be provided beneath each panel-mounted control device describing the function of the device.

B. All pneumatic devices within each panel shall be pre-piped. A pneumatic terminal numbering system shall be applied to all pneumatic lines within panels with aforementioned numbers matching pneumatic terminals shown on control diagrams. This feature is required to assist system checkout service.

C. All electrical devices within each panel shall be prewired to terminal strips with all inter-device wiring within the panel completed prior to installation of the system.

D. All enclosures shall be fully enclosed cabinets with 12 gauge, furniture steel construction with baked enamel finish and hinged key door locks, and shall have removable face and back panels. Panels shall be UL listed for line voltage applications.

E. Electrical and pneumatic panels shall be documented with electric and pneumatic schematics, parts layout, parts listing, component and board identifiers consistent on all documentation, theory of operation and service manuals.

F. Mount panels adjacent to associated equipment on vibration free walls or free standing steel angle supports.

2.4 PNEUMATIC AIR TUBING:

A. Pneumatic air tubing shall be provided as follows:

1. Where tubing is concealed and not accessible, only copper tubing shall be used.
2. Where tubing is exposed, copper tubing or poly in EMT shall be used.
3. Where tubing is concealed but accessible, soft copper tubing may be used or fire resistant (FR) polyethylene tubing may be used, if permitted by local code.
4. Tubing shall be installed horizontally level or vertically plumb with adequate pitch to drip pockets. No tubing shall be concealed within pipe or duct insulation. All tubing shall be supported using straps, cleats, or hangers; wire will not be permitted. Where more than one tube is enclosed in a conduit or tray, furnish color coded or numbered tubing. Type FR polyethylene tubing may be used in local control panels that are enclosed or have side panels.
5. Final termination of control devices may be made with a short run of single tube polyethylene.
6. Pneumatic tubing shall be tested during installation at 150% of operating pressure for twelve hours. No leakage will be allowed.

2.5 CONTROL WIRING:

A. All wiring shall comply with the requirements of local and national electrical codes.

B. Electrical installation shall be according to the following requirements:

1. All wire and cable runs shall be protected with metallic conduit or cable trays. Exceptions are as follows:
   a. NEC Class 2 low voltage wiring where not exposed to view such as above suspended ceilings, in shafts, etc., may be run in cable (when approved by code authority).
   b. Wiring enclosed in temperature control panels.
2. All wire and cable runs shall be labeled or otherwise coded at both ends, and the labeling or coding scheme shall be well organized, consistent and documented (submitted).

C. All low voltage instrumentation wiring shall be minimum 18 AWG stranded copper for sensors and communication. All low voltage cables in ceilings shall be UL listed for air plenum service and suspended neatly from the overhead structure.

D. Pneumatic tubing and wiring shall not be installed in the same conduit or tray.

E. Low voltage wiring shall not be installed in the same conduit as high voltage wiring.

2.6 SENSORS, SWITCHES AND RELAYS:

A. Temperature sensors shall be of the type and have accuracy ratings as indicated and/or required for the application and shall permit accuracy rating of within 1% of the temperature range of their intended use.

B. Outdoor air temperature sensors shall have a minimum range of –52°F to 152°F and an accuracy of within +1°F in this temperature range.

C. Chilled water temperature sensors shall have an accuracy of +0.36°F in their range of application.

D. Differential pressure and pressure sensors shall withstand up to 150% of rated pressure without damaging the device. Accuracy shall be within +2% of full scale.

E. Pressure switches shall have a repetitive accuracy of +2% of range and withstand up to 150% of rated pressure. Sensors shall be diaphragm or bourdon tube design. Switch operation shall be adjustable over the operating pressure range. The switches shall have an application rated Form C, snap-acting, self-wiping contact of platinum alloy, silver alloy or gold plating.

F. Flow switches shall have a repetitive accuracy of +1% of their operating range. Switch actuation shall be adjustable over the operating flow range. Switches shall have snap-acting Form C contacts rated for the specific electrical application.

G. Current sensing relays shall monitor status of motor loads. Switch shall have self-wiping, snap-acting Form C contacts rated for the application. The set-point of the contact operation shall be field adjustable.

H. Control relay contacts shall be rated for 150% of the loading application, with self-wiping, snap-acting Form C contacts enclosed in dustproof enclosure. Relays shall have silver cadmium contacts with a minimum life span rating of one million operations. Relays shall be equipped with coil transient suppression devices.

2.7 CONTROL VOLTAGE:

A. 120 volt or less shall be provided and shall be accomplished either by individual control transformers or by the use of internal panel transformers where available. When panel transformers are used circuits shall be increased as required. In either, fuses shall be provided in each ungrounded primary leg.

PART 3 - EXECUTION

3.1 EXISTING CONTROL DEVICES:

A. During demolition operations, remove all existing control devices, wiring, pneumatic tubing, sensors etc., and all associated supports and accessories, including those found in the existing mechanical room control panels, that are rendered obsolete after the removal of the existing water cooled chillers, condenser water pumps and cooling towers, unless they are specifically required for the operation of the chilled water control sequences described below.

B. The existing control devices, electrical or signal wiring, pneumatic tubing, sensors, etc. required to properly control the existing remaining mechanical equipment at both Myers Hall and Pettigrew Center to remain, and not necessarily associated with the operation of the new air cooled chillers and chilled water pumps, shall remain. The existing control air compressors, refrigerated air dryers and pneumatic tubing infrastructure at both buildings shall remain.

C. Should any of the existing control devices, wiring, pneumatic tubing, sensors, air compressors etc. that are to remain are found to be defective or do not properly fulfill their intended function, immediately notify the Owner and the Engineer for guidance.

3.2 SEQUENCES OF CONTROL:

A. Myers Hall Chilled Water Cooling System:

1. At the start of the occupied periods as dictated by the existing 7-day time clock and at outdoor temperatures above 50 deg. F (adjustable) the new chilled water pump P-1 shall start and during the occupied periods the pump shall run continuously. At the end of the occupied periods the pump shall stop except that the pump shall run (outdoor temperature permitting) whenever either of the two existing building override interval timers is activated.
2. When the chilled water pump starts, upon proof of chilled water flow as sensed by a new chilled water flow switch in the chilled water piping leaving the chiller, in conjunction with a new electrical interlock with the chilled water pump starter, the new chiller ACC-1 shall be enabled. At the end of the occupied periods the chiller shall cycle off according to its factory preset controls.
3. During chiller operation, chilled water supply temperature shall be reset, adjusted in inverse proportion to outdoor temperature as follows. A chilled water supply temperature of 44 deg. F shall be maintained at outdoor temperatures of 80 deg. F and above. As the outdoor temperature drops below 80 deg. F the supply water temperature shall be reset upward until, at an outdoor temperature of 50 deg. F, chilled water supply temperature shall be maintained at 50 deg. F, all adjustable. Provide a new reset controller to accomplish this sequence.
4. When the outdoor temperature drops below 35 deg. F the new chilled water pump shall run continuously for freeze protection, regardless of whether during the occupied periods or not.

B. Pettigrew Center Chilled Water Cooling System:

1. At the start of the occupied periods as dictated by the existing building master program timer and at outdoor temperatures above 50 deg. F (adjustable) the existing chilled water pump CP-1 shall start and during the occupied periods the pump shall run continuously. At the end of the occupied periods the pump shall stop except that the pump shall run (outdoor temperature permitting) whenever the existing building override day-night control is activated during the unoccupied periods.
2. When the chilled water pump starts, upon proof of chilled water flow as sensed by a new chilled water flow switch in the chilled water piping leaving the chiller, in conjunction with a new electrical interlock with the existing chilled water pump starter, the new chiller C-1 shall be enabled. At the end of the occupied periods the chiller shall cycle off according to its factory preset controls.
3. During chiller operation, chilled water supply temperature shall be reset, adjusted in inverse proportion to outdoor temperature as follows. A chilled water supply temperature of 44 deg. F shall be maintained at outdoor temperatures of 80 deg. F and above. As the outdoor temperature drops below 80 deg. F the supply water temperature shall be reset upward until, at an outdoor temperature of 50 deg. F, chilled water supply temperature shall be maintained at 50 deg. F, all adjustable. Provide a new reset controller to accomplish this sequence.
4. When the outdoor temperature drops below 35 deg. F the chilled water pump shall run continuously for freeze protection, regardless of whether during the occupied periods or not.

3.3 CALIBRATION, CHECK-OUT AND ACCEPTANCE:

A. At the completion of the automatic temperature controls system installation, all new and existing relays, switches, controllers, sensors, etc. shall be calibrated and all systems shall be operated for a minimum period of 48 hours.

B. During this check-out period, the control system shall be checked for proper operation in all control modes. Make all necessary repairs as required to leave the control system in proper operating condition.

C. Acceptance test and acceptance:

1. Upon completion of the installation, start up the system and perform all necessary calibration, testing and debugging operations. An acceptance test shall be performed in the presence of the Owner's representative.
2. When the system performance is deemed satisfactory, the system parts shall be accepted for beneficial use and placed under warranty. At this time, a "notice of completion" shall be issued and the warranty period shall start.

D. Provide full instructions to designated personnel in the operation, maintenance, and calibration of the system. The training shall be specifically oriented to the system and associated equipment installed. Four hours of training for the automatic temperature controls shall be provided.

END OF SECTION 230933

SECTION 232113
CHILLED WATER PIPING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 230000, Mechanical General, apply to all work specified in this section.

1.2 QUALITY ASSURANCE:

A. Codes and standards referred to herein are minimum standards. Where the requirements of the drawings or these specifications exceed those of the codes and standards, the drawings and specifications shall govern.

B. Only those firms regularly engaged in the manufacture of piping products of the types, materials and sizes specified herein, and whose products have been in satisfactory use in similar service for not less than five years will be approved.

C. Certify all welders by the ANSI B31.1.0-1967 "Standard Qualification Welding Procedures, Welders and Welding Operators" or by the "Qualification Tests" in Section IX, ASME Boiler and Pressure Vessel Code. Make welder performance qualification tests for positions 2G and 5G in strict compliance with the above standards. Certify welders for the type of pipe materials specified herein. Bear all costs incident to procedures and welder qualification tests.

D. Deliver two copies of the qualification test report and certification with each welder's identification number and letter to the Engineer before any welding commences. Each weld shall bear the welder's identification mark permanently indented in the weld. No welding shall be done when the ambient temperature is below 0 degrees F.

PART 2 - PRODUCTS

2.1 ABOVE GROUND PIPING SYSTEM:

A. Pipe sizes 2" and smaller:

1. Type: Black steel pipe.
2. Class: Schedule 40, ASTM B53.
3. Fittings: Standard weight black malleable iron.
4. Joints: Threaded.

B. Pipe sizes 2-1/2" and larger:

1. Type: Black steel pipe.
2. Class: Schedule 40, ASTM A53.
3. Fittings: Schedule 40 steel.
4. Joints: Butt welded.

2.2 BELOW GROUND PIPING SYSTEMS:

A. Refer to Section 15303 [23 21 15], Pre-Insulated Underground Piping Systems for requirements.

OR

A. All pipe sizes:

1. Type: Black steel pipe.
2. Class: Schedule 40 for pipe sizes 8" and smaller, Schedule 30 for pipe sizes 10" through 16" and 0.375" minimum wall thickness for pipe sizes larger than 18", ASTM A53.
3. Fittings: Steel of the same thickness as the pipe wall.
4. Joints: Butt welded.

B. Coating for underground steel piping:

1. Underground steel pipe for service up to 140 degrees F shall be plastic-coated. All defects or mars in the coating shall be repaired.
2. Apply the external protective coating on a properly prepared surface. The coating shall have sufficient adhesion to the metal surface to prevent underfilm migration moisture, shall be sufficiently ductile to prevent cracking and shall have strength to prevent damage due to handling and soil stress. Steel pipe shall be given one shop-applied coating of coal tar enamel, adhesive thermoplastic resin or thermosetting epoxy.
3. Plastic tape material for use on pipe joints and for repairing damaged areas of shop-applied coating shall be Type I, 10 mils nominal thickness for pipe joints and Type II, 20 mils nominal thickness for coating repairs.
4. Material for use on flanges and other irregular surfaces shall be a coal tar base coating applied to a minimum dry film thickness of 30 mils.
5. Entire installation to be tested using holiday detector and testing procedures as described in American Water Works Association (AWWA) C209-76.

OR

A. Condenser water pipe sizes 14” and smaller:

1. Polyvinyl chloride plastic pipe (PVC) of the sizes indicated.
2. Class: Schedule 40 ASTM D-2241 and ASTM D-1785 Schedule 80.
3. Fittings: PVC plastic to match the pipe system.
4. Joints: PVC flat faced flanges with gaskets and stainless steel bolts and nuts.

OR

A. Condenser water piping sizes 3” and larger:

1. Ductile iron pipe of the sizes indicated, for a working pressure of 150 psi.
2. Class: Class 22 wall thickness, ANSI-A 21.51 for sizes up to and including 12”. Class 24 wall thickness, ANSI-A21.51 for pipe sizes 14 through 24”.
3. Fittings: Ductile iron to match the pipe system.
4. Joints: Flat faced flanges with gaskets and stainless steel bolts and nuts, or mechanical joints and stainless steel bolts and nuts.

2.3 FLANGES:

A. Provide flanges for connections to valves and equipment for above ground pipe sizes 2-1/2" and larger, for all below ground pipe sizes, as dictated by the equipment or where indicated on the drawings. Flanges shall have a working pressure equal to or greater than the pressure classification of the piping system in which they are installed.

B. Flanges shall be forged steel, raised face, screwed type for pipe sizes 2" and smaller (except below ground) and welding-neck type for pipe sizes 2-1/2" and larger, conforming to ANSI B-16.5.

C. Gaskets shall be the asbestos-free, compressed fiber ring type for use between raised face flanges. Gaskets shall be minimum 1/16" thick. Apply a non-stick lubricant coating to both sides of the gasket before installation.

D. All flanges shall be mated with properly sized bolts, nuts and washers. All-thread bolts or rods are not acceptable.

PART 3 - EXECUTION

3.1 GENERAL:

A. Do not lay water lines in the same trench with sewer lines, gas or fuel piping or electrical wiring. Do not install copper tubing in the same trench with ferrous metal piping. Where copper tubing crosses any ferrous metal piping or materials maintain a separation sufficient to prevent di-electric corrosion.

B. Cut pipe accurately to field measurements and work into place without springing or forcing. Ream cut ends free of burrs and cutting spatter. Carefully install pipes plumb and parallel to building lines, columns and walls unless indicated otherwise on the drawings and make allowances for expansion and contraction. Make changes in direction with fittings, pipe bending will not be acceptable. Protect open ends of pipes with temporary covers to prevent the ingress of trash and debris. Clean all dirt and cutting spatter from the inside of pipes before joining the next pipe section. Do not use pieces where a full pipe length will fit.

C. Install piping so as to preserve access to valves, air vents and other equipment. Provide offsets, whether indicated on the drawings or not, to provide the maximum head room possible in mechanical rooms and to avoid conflicts with other trades. Coordinate with the plumbing, fire protection, ductwork and electrical work before installing any piping.

D. Cut threaded pipe square and thread with cleaned out tapered threads, reamed after cutting. Make all threaded connections with pipe thread compound or Teflon tape applied to the male threads, and make up so that no more than two threads will be exposed.

E. Do not locate piping with respect to switchboards, panelboards, power panels, motor control centers or transformers within 42" of the front or rear nor within 36" of the sides of such equipment. These clearances apply vertically from the floor to the overhead structure.

F. Paint ferrous metal piping installed outdoors above ground with one coat of rust inhibiting primer prior to the application of insulation.

3.2 CONNECTIONS TO EQUIPMENT:

A. Provide unions in pipe sizes 2" and smaller and flanges in pipe sizes 2-1/2" and larger to connect piping to equipment. Install the unions and flanges so that the equipment may be removed for servicing or, in case of chillers, the tubes may be completely accessible.

B. Install shut-off valves on the supply and return piping connections to equipment and provide drain valves installed so that the equipment can be completely drained.

C. Provide di-electric unions at all locations where ferrous and non-ferrous or other dissimilar metals join.

3.3 TESTING:

A. Leak-test the chilled water piping system at 1.5 times its operating pressure but in no case less than 125 psi. Isolate vital equipment or temporarily remove from the piping prior to testing if the pipe test pressure is above the equipment rating.

B. Test the piping system and repair as required before the installation of any insulation or pipe covering, or before the application of paint on piping installed outdoors.

C. The test medium shall be water under hydrostatic pressure with all air removed from the system. If there is a danger of freezing temperatures leak testing may be performed using compressed air, in which case all joints and welds shall be inspected for leaks using soapy water. Hold test pressure for a minimum of 4 hours with no drop in pressure except that due to variations in temperature. Hold compressed air tests for 8 hours.

D. The Engineer reserves the right to observe all pressure testing and he shall be notified at least 48 hours in advance of any test.

3.4 CLEANING:

A. Clean the piping system to remove all trash, debris, mill scale, cutting oil and welding spatter before being placed into operation and in any event before any control device or other sensitive items of equipment are installed. See Section 232513, Chemical Treatment System. If debris has collected at valves, disassemble the valves and clean prior to closing them for the first time.

B. After 24 hours of operation and thereafter as necessary blow down all strainers until a clean discharge is produced. Prior to turning the systems over to the Owner remove all start-up strainers, install all final strainers and clean all strainer baskets.

END OF SECTION 232113

SECTION 232120
PIPING ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 230000, Mechanical General, apply to all work specified in this section.

1.2 QUALITY ASSURANCE:

A. Codes and standards referred to herein are minimum standards. Where the requirements of the drawings or these specifications exceed those of the codes and standards, the drawings and specifications shall govern.

B. Only those firms regularly engaged in the manufacture of piping accessories of the types, materials and sizes specified herein and whose products have been in satisfactory use in similar service for not less than five years will be acceptable.

PART 2 - PRODUCTS

2.1 "Y" TYPE STRAINERS:

A. All strainers shall be "Y" type unless otherwise indicated and shall have a working pressure rating equal to or greater than the pressure classification of the piping system in which they are installed, but in no case less than 200 psi at 100 degrees F. Strainers installed in galvanized piping systems shall be galvanized.

B. Strainers 2" and smaller shall be cast iron conforming to ASTM A216 or semi steel conforming to ASTM A278, "Y" body type with threaded ends, perforated 20 mesh stainless steel screen, machined screen seat and blowdown outlet.

C. Strainers 2-1/2" and larger shall be cast iron conforming to ASTM A216, "Y" body type with raised face flanged ends, perforated stainless steel screen, machined screen seat and blowdown outlet. Perforations shall be 1/16" for sizes 4" and smaller and 1/8" for all larger sizes.

D. "Y" type strainers manufactured by Spirax-Sarco, Mueller, Armstrong or Hoffman will be acceptable.

2.2 AUTOMATIC AIR VENTS:

A. Automatic air vents shall be 3/4" size and they shall be designed to automatically eliminate air from the piping system without allowing the passage of water.

B. Automatic air vents shall have a semi-steel or cast iron body, bolted cover, stainless steel float, valve head and seat and 3/8" or 1/2" discharge tapping. The float, valve and seat shall be accessible for service.

C. Automatic air vents manufactured by Spirax-Sarco, APCO, Hoffman or Taco will be acceptable.

2.3 COMBINATION PRESSURE/TEMPERATURE TEST PLUGS:

A. Test plugs shall have a working pressure equal to or greater than the working pressure of the piping system in which they are installed.

B. Test plugs shall be 1/2" in size, designed to be screwed into a 1/2" NPT pipe tee or threadolet. Test plugs shall be constructed of brass with two self-closing Nordel plug cores. Each test plug shall have a knurled brass cap with "O" ring gasket, attached to the plug with a brass chain.

C. Combination pressure/temperature test plugs manufactured by Peterson Equipment Co. ("Pete's Plug") or Universal Lancaster Corp. will be acceptable.

2.4 THERMOMETERS AND THERMOMETER WELLS:

A. Thermometers shall be red-reading, stem type, adjustable to any angle through a 180 degree arc with locking device. Thermometers shall have a cast aluminum case with baked-on enamel finish and 9" scale. Provide a separable socket and where installed on insulated piping the socket shall be the extended neck type.

B. Thermometer scale ranges shall be 0 to 100 deg. F for chilled water.

C. Thermometer wells shall be constructed of brass and shall be provided with brass caps with chain and gasket. Wells installed in insulated piping shall be the extended neck type.

D. Thermometers and thermometer wells manufactured by Weksler, Trerice or Weiss will be acceptable.

2.5 PRESSURE GAUGES AND GAUGE COCKS:

A. Pressure gauges shall be flangeless type with 4-1/2" dial, cast aluminum case, stainless steel gear movement, phosphor-bronze bourdon tube, forged brass rod socket and tip, Plexiglas dial cover, safety blow-out disc and 1/4" lower connection.

B. Scale ranges shall be compatible with the pressures of the system in which they are installed so that normal working pressure is at approximately mid-range. Scale ranges shall be follows:

Working Pressure	Scale Range
Less than 50 psig	0 to 100 psig
50 to 100 psig	0 to 150 psig
100 to 200 psig	0 to 300 psig

C. Pressure gauges installed at pump suction lines, or when a single gauge is installed to read both pump suction and discharge pressures, gauges shall be the compound type with the following scale ranges:

Approximate Pump Head	Scale Range
Less than 100 ft	30” Hg to 60 psig
100 to 200 ft	30” Hg to 150 psig
200 to 300 ft	30” Hg to 300 psig

D. Gauge pointer shall be micrometer adjustment type recalibrated from the front of the gauge.

E. Provide each pressure gauge with a needle valve type gauge cock suitable for the system pressures and temperatures in which they are installed. Provide pressure snubbers on gauges at pump suction and discharge lines and at any other location subject to rapidly fluctuating pressures. Snubbers shall be the porous metal type capable of pressure equilibrium within 10 seconds of the pressure change.

F. Pressure gauges manufactured by Weksler, Trerice or Weiss will be acceptable.

2.6 UNIONS:

A. Unions shall be of the same material as the pipe in which they are installed and shall have a temperature and pressure rating equal to or greater than the working temperature and pressure of the piping system.

2.7 DIELECTRIC ADAPTERS:

A. Dielectric adapters shall be the union type for pipe sizes 2" and less and flanged type for pipe sizes 2-1/2" and larger. Flange type adapters shall be complete with gasket and two isolators at each bolt. Dielectric adapters shall limit the galvanic corrosion to a maximum of 1% of the short circuit current.

B. Dielectric adapters manufactured by Ebco, Crane or Capital will be acceptable.

2.8 FLEXIBLE PIPE CONNECTORS:

A. Flexible pipe connectors for water piping shall be the spherical type made of multiple plies of nylon cord, fabric and neoprene, hydraulically molded. Connectors for pipe sizes 2" and smaller shall have threaded ends. Connectors for pipe sizes 2-1/2" and larger shall have flanged ends with a recessed groove to receive the connector's raised neoprene face.

B. Flexible pipe connectors shall be line size and shall be selected for the temperatures and pressures encountered in the pipe, but in no case less than 150 psig and 220 degrees F.

2.9 AIR SEPARATORS:

A. Air separators shall be designed to collect free and entrained air in the piping system and shall be constructed of steel in accordance with the ASME Boiler and Pressure Vessel Code. Each separator shall bear the ASME stamp and shall indicate the design working pressure. The design working pressure shall be equal to or greater than the pressure in the piping system in which it is installed.

B. Air separators shall be sized for the full system flow in gallons per minute but in no case shall the air separator inlet and discharge connection sizes be less than the connecting piping. Air separators shall have screwed connections for pipe sizes 2" and smaller and flanged connections for pipe sizes 2-1/2" and larger.

C. Each air separator shall have a minimum 3/4" tapping on the top for the installation of an automatic air vent and a blowdown connection at the bottom of the tank. An integral removable strainer shall be provided with each air separator constructed of stainless steel with 3/16" perforations and a free area of not less than five times the cross sectional area of the connecting piping. Each air separator shall be finished with one coat of primer and one coat of shop enamel.

D. Air separators manufactured by Bell & Gossett, Taco or Woods will be acceptable.

2.10 BLADDER EXPANSION TANKS:

A. Each bladder type expansion tank shall consist of a fabricated steel shell and a removable bladder designed for full acceptance volume. Expansion tank volume shall be as indicated on the drawings.

B. The shell shall be fabricated of steel, designed and fabricated in accordance with the ASME Boiler and Pressure Vessel Code and shall bear the ASME stamp. The working pressure shall be 125 psi at 240 degrees F and shall be clearly indicated. The shell shall have a flanged connection to accept

the bladder, a standard Schraeder air valve with tight closure for charging the shell with air, 3/4" NPT drain with plug, [a floor mounting skirt when installed on the floor] and lifting rings. The shell shall be finished with one shop coat primer and one shop coat of air dry enamel.

C. The bladder shall be easily replaceable and shall be constructed of heavy duty elastomeric rubber. The bladder shall expand to the full volume of the shell.

D. Each tank shall be shipped with a factory pre-charge of air and shall then be field charged to a pressure equal to the hydrostatic pressure of the system at the point where the tank is installed. The field charging of the tank shall be done prior to the introduction of system water into the tank.

E. Expansion tanks manufactured by Taco, Armstrong, Wood Industrial or Bell and Gossett will be acceptable.

2.11 HEAT CABLE FOR FREEZE PROTECTION:

A. Electric cable shall be the self-regulating type which responds to varying localized temperatures by varying the heat output along its length to a maximum of 8 watts per foot. Constant wattage heat cables will not be acceptable.

B. Each heat cable shall consist of two 16 gauge AWG tinned copper bus wires embedded in parallel in a polymer core allowing the cable to be crossed over itself without over-heating, to be used directly on plastic pipe, and to be cut to length in the field. The cable shall be covered with a radiation cross-linked modified polyolefin dielectric jacket.

C. Each heat cable shall be rated for 8 watts per foot at 50 degrees F. based on a pipe covering of 1" thick fiberglass insulation and on metal piping.

D. Provide all power connection hardware, splices and end seals required to accomplish the installation. The heat cable and all accessories shall be UL listed and shall conform to the requirements of Division 26. Each heat cable shall be controlled by an ambient sensing thermostat set at 40 degrees F through an appropriate contactor.

E. Electric heat cable and accessories manufactured by Raychem, Easy Heat or approved equal will be acceptable.

PART 3 - EXECUTION

3.1 STRAINERS:

A. Install strainers at the suction of all pumps, immediately upstream of pressure reducing valves, and other sensitive devices and elsewhere as indicated on the drawings.

B. Install strainers so that the filter screen can be easily removed for cleaning. Provide a pipe union in the blowdown piping if required to enable screen removal.

C. On strainers 2" and smaller provide pipe nipple, ball valve and hose end adapter. On strainers 2-1/2" and larger provide pipe nipple and gate valve and extend blowdown piping to the nearest floor drain.

3.2 AUTOMATIC AIR VENTS:

A. Provide automatic air vents in accessible locations whether indicated or not, at all high points in the piping system, on the vent connection of each air separator, at any local high points in the

piping system subject to the trapping of air pockets and at other locations indicated on the drawings.

B. Pipe the discharge, using copper tubing, to the nearest floor drain or to the outside where it shall terminate 18" above grade. Discharges from multiple air vents may be grouped together but the discharge piping shall be increased one pipe size.

C. Provide a ball or gate valve at the inlet of each automatic air vent.

3.3 COMBINATION PRESSURE/TEMPERATURE TEST PLUGS:

A. Install combination pressure/temperature test plugs on the inlet and outlet piping of each chiller, on the entering and leaving piping at each control valve and at other locations indicated on the drawings.

B. Furnish to the Owner a complete pressure and temperature test kit comprising pressure gauge, temperature gauge, gauge fittings and probes and any other equipment necessary to take accurate temperature and pressure readings from the test plugs, all assembled in a carrying case.

3.4 THERMOMETERS AND THERMOMETER WELLS:

A. Install thermometers in thermometer wells at the inlet and outlet to each chiller cooler bundle and at other locations where indicated on the drawings.

B. Wells shall penetrate approximately 75% of the pipe diameter and shall be installed in tees or elbows on small pipe sizes. Install wells vertically in horizontal piping or at a 45 degree angle in vertical piping and fill with oil.

3.5 PRESSURE GAUGES AND GAUGE COCKS:

A. Install pressure gauges and gauge cocks at the suction and discharge lines of each pump and at other locations where indicated on the drawings.

3.6 UNIONS:

A. Install unions at all locations in piping 2" and smaller necessary for the removal or maintenance of valves, control devices, steam traps, tube bundles, coils and other equipment.

3.7 DIELECTRIC ADAPTERS:

A. Install dielectric adapters between any ferrous and copper connection or between any dissimilar metals subject to galvanic action including pipe connections and connections between piping and equipment.

B. Install dielectric adapters in locations accessible for service.

3.8 FLEXIBLE PIPE CONNECTORS:

A. Provide a flexible pipe connector at the suction and discharge connections of each pump and at other locations indicated on the drawings. Install flexible pipe connectors so that the full weight of the connecting piping is independently supported and that no pressure is applied to the pump connections. Do not use flexible connectors for correcting pipe misalignment.

3.9 AIR SEPARATORS:

A. Support air separators independently of the piping system. Air separators may be suspended from the structure.

B. Provide a pipe nipple and ball valve on the blowdown connection and pipe the discharge to the nearest floor drain.

3.10 EXPANSION TANKS:

A. Provide an isolation gate valve and union in the tank inlet piping to facilitate bladder inspection or replacement. The drain opening shall remain plugged.

B. When the tank is indicated to be floor mounted, provide a 4 inch high concrete equipment pad. When the tank is indicated to be suspended, suspend from the structure above and grade horizontal piping a minimum of 1/4" in 5 feet up to the tank.

3.11 HEAT CABLE FOR FREEZE PROTECTION:

A. Apply electric heat cable on the piping linearly after the piping has been successfully pressure tested and painted in accordance with Section 232113, Chilled Water Piping System, and prior to the application of insulation. Secure the cable to the pipe with cable ties or fiberglass tape. Wrap the pipe with a minimum of two spiral turns per linear foot of pipe and hard wire the power connections to a junction box.

B. Install electric heat cable on all water piping outside the building and on piping installed in un-heated areas of the building subject to freezing.

C. Before applying pipe insulation subject the heat cable to a test using a 1000 VDC megger. Minimum insulation resistance should be 20 to 1000 megaohms regardless of cable length. Apply "Electric Traced" signs to the outside of the pipe insulation.

END OF SECTION 232120

SECTION 232123
CENTRIFUGAL PUMP

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 230000, Mechanical General, apply to all work specified in this section.

1.2 QUALITY ASSURANCE:

A. Furnish pump and install as indicated and scheduled on the drawings. Provide all accessories, controls and wiring.

B. Codes and regulations referred to are minimum standards. Where the requirements of these specifications or the drawings exceed those of the codes and regulations, the drawings and specifications shall govern.

C. Centrifugal pump manufactured by Allis-Chalmers, Aurora, Peerless, Patterson, Armstrong or Bell and Gossett will be acceptable.

PART 2 - PRODUCTS

2.1 CLOSE-COUPLED END SUCTION PUMP:

A. Furnish and install bronze fitted, single stage, end suction centrifugal pump.

B. For chilled water service pump shall be designed for 175 psi at 225 degrees F working pressure. Pump flanges shall be drilled and tapped for gauge connections.

C. Pump casing shall be of a closed-grained cast iron design. Impeller shall be bronze with bronze wear rings. Shaft shall be steel with bronze sleeve. Seals shall be of the mechanical type and capable of operating at 250 degrees F.

D. Bearings shall be the ball type, grease lubricated with a 200,000 hours B-10 life.

E. Pump motor shall have the capacity to prevent overloading with the pump operating at any point on the curve, up to a minimum of 125% of the specified GPM. Shut-off head shall be a minimum of 120% of the operating head.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install pump as indicated and in strict accordance with the manufacturer's written instructions.

B. Furnish one spare set of seals for the pump and deliver to the Owner.

C. Do not operate the pump until its respective system is filled with liquid.

END OF SECTION 232123

SECTION 232513
CHEMICAL TREATMENT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 230000, Mechanical General, apply to all work specified in this section.

1.2 COORDINATION:

A. The chemical treatment system of one manufacturer has been used as the basis of design. Any modifications to wiring, controls or building structure that may result from the use of any other system shall be coordinated with all parties. Any modifications shall be performed without incurring any additional costs to the Contract.

1.3 QUALIFICATIONS:

A. All chemicals, service and equipment shall be provided by a recognized firm specializing in chemical treatment of water bearing heat exchange equipment for protection against scale, corrosion and biological fouling. The company shall have a minimum of 10 years experience in this specialty field and shall have regional laboratories and service representatives capable of making water analysis on the site to implement immediate corrective action for any water related problems.

1.4 WATER ANALYSIS TEST REPORT:

A. Submit three copies of the water analysis tests and the chemical manufacturers' conclusions for selecting the particular chemical proposed for each system.

PART 2 - PRODUCTS

2.1 CHILLED WATER SYSTEM:

A. A shot feeder shall be used to provide a periodic shock dosage of chemicals into the system. The feeder shall be isolated, drained, filled with chemicals then re-opened to the system. The feeder shall have a minimum 5 gallon capacity with 3-1/2" wide mouth opening and with an operating pressure suitable for the system to be treated. Treatment shall include a nitrite-based corrosion inhibitor.

B. The installer shall test the system water available at the site and provide a twelve month supply of chemicals which shall not be injected into the system until after the piping systems have been chemically cleaned and flushed. The chemical manufacturer shall include instructions for handling, storage and mixing of chemicals and dosage requirements for this specific installation. All chemicals shall be provided by the manufacturer of the chemical treatment equipment.

C. The chemical treatment manufacturer's representative shall visit the facility every month during the first twelve months of operation. He shall test the water to ensure that the treatment being used is correct, that the proper dosage is being used and to verify that the equipment is operating properly. Each visit shall be verified in writing to the Owner.

2.2 CLEANING OF PIPING SYSTEMS:

A. Before operating the mechanical systems, the chemical treatment installer shall chemically clean the chilled water piping system. The chemicals used shall be for removal of grease, dirt, mill scale, welding slag and other foreign materials in the system.

B. During the cleaning and flushing process, strainers shall be cleaned and drain valves shall be opened periodically to remove sediment from the system. Chemical solutions shall be circulated through the piping until the system is clean, after which the systems shall be flushed with clean water. After the flushing process the piping system shall be refilled with clean water and charged with operating chemicals as specified above.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. The system shall be installed as indicated and in conformance with the manufacturer's recommendations. Coordinate the actual systems to be provided with all trades.

B. The system shall not run prior to flushing and injection of chemicals. Failure to comply may result in replacement of all equipment that ran prior to such cleaning and treatment.

END OF SECTION 232513

SECTION 236419
AIR COOLED RECIPROCATING CHILLER

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 230000, Mechanical General, apply to all work specified in this section.

1.02 QUALITY ASSURANCE:

A. Codes and regulations referred to are minimum standards. Where the requirements of these specifications or the drawings exceed those of the codes and regulations the drawings and specifications shall govern.

B. Air cooled reciprocating water chiller shall be provided to meet the minimum capacities scheduled, and shall meet all constraints of construction. Chiller ratings shall be certified in accordance with ASHRAE Standard 15 and shall conform to ANSI/ARI 550-77. The cooler shall be constructed and tested in accordance with the ASME Boiler and Pressure Vessel Code Section VIII.

C. The maximum permissible noise levels under design operating conditions, when measured in accordance with ARI Standard 575-73 Specified methods and Qualification, shall not exceed 90 dBA.

1.03 ACCEPTABLE MANUFACTURERS:

A. Chiller manufactured by Trane, Carrier or York will be acceptable.

1.04 WARRANTY:

A. The equipment manufacturer shall warrant the compressor and compressor motor for a period of four years immediately following the expiration of the first year warranty. The compressor and compressor motor parts shall be replaced or repaired by the equipment manufacturer. This warranty does not include field labor required.

PART 2 - PRODUCTS

2.01 DESCRIPTION:

A. The unit shall be weatherproof complete with compressor, condenser, insulated cooler, starter, suction and discharge gauges and low ambient operating package, and shall include dual pressure switch, differential oil pressure switch, expansion valve, solenoid refrigerant valve, filter drier, safety thermostat, temperature controller, pressure relief valve, charging valve, master indicating sight glass, liquid line strainer, chilled water flow switch and head pressure control for operation down to 0 degrees F. The unit shall include a control panel mounted and wired and shall be shipped complete from the factory with full charge of refrigerant. Unit shall be rated in accordance with ARI Standard 590, Latest Edition.

2.02 EVAPORATOR:

A. Evaporator shall be the direct expansion shell and tube type with refrigerant in the tubes and water in the shell, with design water side working pressure of 150 psi and 225 psi for the tube side. Refrigerant heads shall be removable. Evaporator shall be equipped with a thermostat controlled

electric heater cable wrapped around the shell under the insulation for freeze protection down to an ambient temperature of -20 degrees F. Unit shall have two completely independent refrigerant circuits. For the water side the performance shall be based on a water velocity of not less than 3 fps nor more than 10 fps, and a fouling factor of 0.00010.

B. Shell shall be insulated with a 3/4" closed cell foam insulation with a maximum K factor of 0.28.

2.03 CONDENSER:

A. Condenser coil shall be constructed of seamless copper tubes mechanically expanded into aluminum fins with 150 psig design working pressure and pressure tested at 425 psig.

B. Condenser fans shall be propeller type with vertical air discharge. Fan blades shall be statically and dynamically balanced and protected by fan blade guards. Each fan shall be driven by an individual motor. Condenser fan motors shall be 3 phase, high torque type, internally protected, ball bearing construction, permanently lubricated, totally enclosed air-over type.

C. Coil surfaces shall be protected by grilles or steel mesh panels.

2.04 REFRIGERANT CIRCUIT:

A. Each circuit shall include a liquid line solenoid valve, filter drier, liquid line sight glass and thermal expansion valve.

2.05 COMPRESSORS:

A. The compressors shall be of the accessible semi-hermetic reciprocating design (1750 rpm maximum) with all rotating parts statically and dynamically balanced, reversible positive displacement oil pump, oil charging valve, oil level sight glass and immersible crankcase heater. Compressor discharge and suction valves shall be the backseating seal-cap stop valve type. Each compressor shall have an internal relief valve to relieve excessive discharge pressure into the suction chamber. Each compressor shall include a temperature sensor located in the motor windings to provide protection against motor overheating. The compressors shall start fully unloaded. Compressors shall be factory mounted on spring isolators.

B. Unit shall have a minimum of four steps of capacity control up to 80 tons capacity and a minimum of six steps of capacity control for capacities above 80 tons.

2.06 CONTROL PANEL:

A. Control panel shall be factory mounted and wired in a weatherproof housing with hinged doors and locks. The controls shall operate on 120 volts. The starter section shall include the main single point power connection, starting controls, non-cycling compressor overloads, oil pressure cutout and control circuit transformer. The refrigerant section shall contain the reset relay, compressor service switches, motor protector, differential oil pressure control, high and low pressure controls, central unit microprocessor, compressor anti-recycle function, compressor lead-lag, low water temperature cutout, loss of charge protection, leaving chilled water temperature control, load limiting, control capability for unit's low ambient start logic, timed periodic pump out, chilled water setpoint reset and hot gas bypass logic.

B. The unit shall include an electrically operated automatic capacity control system which shall be controlled by the supply chilled water temperature sensor to provide a minimum of four step unloading of the compressor and reduced motor input at partial loads. The controls and starting equipment shall be factory assembled in the weatherproof, key lock control panel.

2.07 POWER SUPPLY MONITOR:

A. Provide protection against phase loss, phase reversal, unbalance, incorrect phase sequence and low line voltage. The device shall automatically reset and restore power to the unit when the fault condition it sensed is corrected.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. The chiller shall be installed as indicated and in full compliance with the manufacturer's recommendations. Coordinate the actual unit to be provided with all trades.

B. Chiller shall be factory run tested and be shipped with a full operating charge of refrigerant and oil. Manufacturer shall submit four copies of test report to the **Architect**.

C. The chiller shall be mounted on a structural concrete base. Coordinate carefully with the site drawings for locations and dimensions for mounting. Provide housed spring type vibration isolators with minimum 1" deflection at each chiller mounting hole location. Bolt isolators to chiller and supports. Isolators shall be galvanized.

D. Start-up of the chiller shall be by, or under the direction of, an approved factory trained mechanic regularly employed by the equipment supplier. A letter by the equipment supplier certifying compliance with this requirement and a copy of the start-up log shall be submitted to the **Architect** and attached to the equipment warranty.

END OF SECTION 236419

SECTION 236419
AIR COOLED SCROLL CHILLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 230000, Mechanical General, apply to all work specified in this section.

1.2 QUALITY ASSURANCE:

A. Codes and regulations referred to are minimum standards. Where the requirements of these specifications or the drawings exceed those of the codes and regulations the drawings and specifications shall govern.

B. Air cooled, multiple scroll compressor chillers shall be provided to meet the minimum capacities scheduled and shall meet all constraints of construction. Chiller ratings shall be certified in accordance with ASHRAE Standard 15 and shall conform to ARI Standard 550-590 and ASHRAE 90.1. The cooler shall be constructed and tested in accordance with the ASME Boiler and Pressure Vessel Code Section VIII, Division 1. Each chiller shall be provided with the following:

1. Zero ozone depletion potential refrigerant R-410A.
2. Electrical power and control connections.
3. Chilled water connections.
4. Factory start-up.
5. Charge of refrigerant and oil.

C. The maximum permissible noise levels under design operating conditions, when measured in accordance with ARI Standard 575-73 Specified methods and Qualification, shall conform to the sound pressure levels indicated on the drawings.

1.3 ACCEPTABLE MANUFACTURERS:

A. Chillers manufactured by Trane, Carrier or JCI/York will be acceptable.

1.4 WARRANTY:

A. The equipment manufacturer shall warrant the compressors and compressor motors for a period of four years immediately following the expiration of the first year warranty. The compressor and compressor motor parts shall be replaced or repaired by the equipment manufacturer. This warranty does not include field labor required.

PART 2 - PRODUCTS

2.1 CHILLER MATERIALS AND COMPONENTS:

A. General: Install and commission a factory assembled, charged and tested air cooled scroll compressor chillers as specified herein. Each chiller shall be designed, selected and constructed using a refrigerant with flammability rating of “1”, as defined by ANSI/ASHRAE Standard 34 and Safety Classification of Refrigerants. Each chiller shall include a complete system with not less than two refrigerant circuits, scroll compressors, direct expansion type evaporator, air-cooled condenser, refrigerant, lubrication system, interconnecting wiring, safety and operating controls including

capacity controller, control center, motor starting components and other features as specified herein.

B. Cabinet: External structural members shall be constructed of heavy gage, galvanized steel coated with baked on powder paint which, when subjected to ASTM B117, 1000 hour 5% salt spray test, yields minimum ASTM 1654 rating of "6".

C. Provide service discharge isolation valves and a system high-pressure relief valve in compliance with ASHRAE 15.

D. Pressure transducers and readout capability:

1. Provide discharge pressure transducers to sense and display discharge pressure.
2. Provide suction pressure transducers to sense and display suction pressure.

2.2 COMPRESSORS:

A. Compressors shall be hermetic, scroll-type including:

1. Compliant design for axial and radial sealing.
2. Refrigerant flow through the compressor with 100% suction cooled motor.
3. Large suction side free volume and oil sump to provide liquid handling capability.
4. Compressor crankcase heaters.
5. Annular discharge check valve and reverse vent assembly to provide shutdown and reverse rotation protection.
6. Initial oil charge.
7. Oil level sight glass.
8. Vibration isolator mounts for compressors.
9. Brazed-type connections for fully hermetic refrigerant circuits.
10. Compressor motor overloads capable of monitoring compressor motor current.

2.3 REFRIGERANT CIRCUIT COMPONENTS:

A. Each refrigerant circuit shall include a liquid line shutoff valve with charging port, low side pressure relief device, filter-drier, solenoid valve, sight glass with moisture indicator, thermostatic expansion valves, flexible, closed-cell foam insulated suction line and suction pressure transducer.

2.4 HEAT EXCHANGERS:

A. Evaporator:

1. Evaporator shall be direct expansion type with refrigerant inside high efficiency copper tubes, with chilled liquid forced over the tubes by galvanized steel baffles.
2. Evaporator shall be constructed, tested and stamped in accordance with applicable sections of ASME pressure vessel code for minimum 450 psig refrigerant side design working pressure and 150 PSIG water side design working pressure.
3. The shell shall be covered with ¾", flexible, closed cell insulation, thermal conductivity of 0.26k BTU/HR-Ft_2-^oF/in. maximum. Water nozzles shall have grooves for mechanical couplings.
4. Provide vent and drain fittings and thermostatically controlled heaters to protect to -20^oF ambient in off-cycle.

B. Air cooled condenser:

1. Condenser coils shall be made of a single material to avoid galvanic corrosion due to dissimilar metals. Coils and headers shall be brazed as one piece. The design working pressure of the coil shall be 650 PSIG.
2. Low sound fans shall be dynamically and statically balanced, direct drive, corrosion resistant glass fiber reinforced composite blades molded into a low noise, full-airfoil cross section, providing vertical air discharge and low sound. Each fan shall be in its own compartment to prevent cross flow during fan cycling. Guards shall be heavy gage PVC coated or galvanized steel.
3. Fan motors shall be high efficiency, direct drive, 3 phase, with insulation class "F", current protected, totally enclosed air-over (TEAO), rigid mounted, with double sealed, permanently lubricated ball bearings.

2.5 CONTROLS:

A. General: Provide automatic start, stop, operating and protection sequences across the range of scheduled conditions and transients.

B. Microprocessor enclosure shall be rain and dust tight NEMA 3R/12 powder painted steel cabinet with hinged, latched and gasket sealed door.

C. Microprocessor control center:

1. Provide automatic control of compressor start/stop, anti-coincidence and anti-recycle timers, automatic pump-down shutdown, condenser fans, evaporator pump, evaporator heater, unit alarm contacts and chiller operation from 0°F to 125°F ambient. Provide automatic reset to normal chiller operation after power failure.
2. Provide software stored in non-volatile memory with programmed set-points retained in lithium battery backed real time clock memory for minimum 5 years.
3. Provide liquid crystal display with descriptions in English and numeric data in English units. Provide sealed keypad with sections for set-points, display/print, entry, unit options and clock, and on/off switch.
4. Provide programmable set-points for: chilled water temperature set-point and range, remote reset temperature range, set daily schedule/holiday for start/stop, manual override for servicing, low and high ambient cutouts, number of compressors, low liquid temperature cutout, low suction pressure cutout, high discharge pressure cutout, anti-recycle timer and anti-coincident timer.
5. Display data: Provide return and leaving water temperatures, low leaving liquid temperature cutout setting, low ambient temperature cutout setting, outdoor air temperature, suction pressure cutout setting, each system suction pressure, chilled water temperature reset from the Automatic Temperature Controls via a 4-20 milliamp or 0-10 VDC input, anti-recycle timer status for each compressor, anti-coincident system start timer condition, compressor run status, no cooling load condition, day, date and time, daily start/stop times, holiday status, automatic or manual system lead/lag control, lead system definition, compressor starts/operating hours (each), status of hot gas valves, evaporator heater and fan operation, run permissive status, number of compressors running, liquid solenoid valve status, load and unload timer status and chilled water pump status.
6. System safeties: For individual compressor systems to perform auto shut down, manual reset shall be required after the third trip in 90 minutes. Include high discharge pressure, low suction pressure, high pressure switch and motor protector. Compressor motor protector shall protect against damage due to high input current or thermal overload of windings.

7. Unit safeties shall include automatic reset and cause compressors to shut down if low ambient, low leaving chilled water temperature, under voltage and flow switch operation. Provide flow switch and wiring per chiller manufacturer's requirements.
8. Alarm contacts: Provide low ambient, low leaving chilled water temperature, low voltage, low battery, high discharge pressure and low suction pressure.

D. In addition, provide any controls not listed above, necessary for automatic chiller operation. Contractor shall provide field control wiring necessary to interface sensors to the chiller control system.

2.6 POWER CONNECTION AND DISTRIBUTION:

A. Power panels. Provide the following:

1. NEMA 3R/12 rain and dust tight, powder painted steel cabinets with hinged, latched, and gasket sealed outer doors. Provide main power connection, control power connections, compressor and fan motor start contactors, current overloads and factory wiring.
2. Power supply shall enter unit at a single location, shall be 3 phase of scheduled voltage and shall connect to individual terminal blocks per compressor. Separate disconnecting means and/or external branch circuit protection shall be required per applicable local or national codes.

B. Compressor, control and fan motor power wiring shall be located in and enclosed panel or routed through a liquid tight conduit.

2.7 ACCESSORIES AND OPTIONS:

A. Provide the following accessories and options:

1. Single point non-fused disconnect and lockable external handle to isolate the unit power voltage for servicing.
2. Vapor proof SPDT, NEMA 4X flow switch rated for -20°F to 250°F.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. The chillers shall be rigged and installed as indicated and in full compliance with the manufacturer's recommendations. Coordinate the actual units to be provided with all trades.

B. Chillers shall be factory run tested and be shipped with a full operating charge of refrigerant and oil. Manufacturer shall submit four copies of test report to the Engineer.

C. The chillers shall be mounted on a structural concrete base. Coordinate carefully with the site drawings for locations and dimensions for mounting. Provide rubber-in-shear type vibration isolators at each chiller mounting location.

D. Start-up of the chillers shall be by, or under the direction of, an approved factory trained mechanic regularly employed by the equipment supplier. A letter by the equipment supplier certifying compliance with this requirement and a copy of the start-up log shall be submitted to the Engineer and attached to the equipment warranty.

END OF SECTION 236419

SECTION 26 0000
ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 INSTRUCTIONS TO BIDDERS:

A. Proposals for this work shall be based upon examination of the site and conditions thereon and/or therein. Proposals shall take into consideration said conditions which may affect work covered by this specification.

B. Coordinate with the Owner or designated Owner's representative to learn of any hazardous condition or material that may exist at the site.

1.2 GENERAL:

A. The plans accompanying these specifications are generally diagrammatic and do not show all details required for the complete work. Establish details of the work as necessary to provide for the complete installation of systems and materials. Arrange the work so as to avoid interference with other building components or systems as actually installed. Lay out the work and be responsible for locations, levels, grades, and architectural or structural features such as beams, fire barriers, ceiling types and heights, slab or wall thickness, cabinet heights, or door swings. Do not scale the plans for any dimension. Verify dimensions before starting work and report any discrepancy or interference to the owner's representative for clarification.

B. The use of manufacturer's names and catalog numbers indicates materials that are accepted by the Engineer. Substitutes of equivalent materials of similar quality, the same or better with respect to style and function, may be submitted for review and acceptance. Any proposed exceptions to requirements shall be clearly and fully stated in one place, including required related changes to building systems, operating procedures, and maintenance functions.

C. Provide a licensed Master Electrician to develop details of the work for each system, and if required to certify said work to Building Officials.

D. Shop drawings and product information shall be submitted for review for materials as listed, or for any substitute material, as follows:

1. Service and distribution equipment

E. Record on one set of plans all changes and deviations from the contract plans. Record final location of equipment, disconnect switches, controls, buried conduits, etc. Make sufficient measurements to locate major conduit runs and show same on record plans as as-built conditions. Transfer changes and deviations to reproducible plans and deliver to the Owner’s representative.

F. Leave systems or elements installed in proper working order, and replace work or material, which develops defects, except from ordinary wear and tear, within one year from the date of final acceptance by the Owner, or as otherwise indicated in the Contract Warranty.

1.3 QUALITY ASSURANCE:

A. Work shall be furnished and installed as a minimum in accordance with the applicable requirements and recommendations of the latest locally adopted edition of the following codes and standards:

1. National Electrical Code (NEC), NFPA-70.

2. Life Safety Code, NFPA-101 and other NFPA Standards applicable to this project.
3. National Electrical Contractors Association (NECA), National Electrical Manufacturers Association (NEMA), Institute of Electrical and Electronics Engineers (IEEE), and American National Standards Institute (ANSI) Standards applicable to this project.
4. Americans with Disabilities Act.
5. U.L. Standards and listing requirements.
6. Federal, state, and local laws, ordinances, codes, and rulings of building officials having jurisdiction, including but not limited to The International Building Code and locally enforced Accessibility Code and Energy Code.
7. Owner's published design criteria.

B. Materials furnished shall be new. Materials shall be manufacturer's standard established product line, and shall be listed and labeled for the application by Underwriter's Laboratories (UL), or shall be certified by other approved laboratory or by the building official having jurisdiction.

C. The quality and functional requirements as incorporated by selection of systems or materials, including spare capacity and options for future usage, shall not be reduced even if they meet minimum requirements as stated by applicable codes and criteria.

1.4 WARRANTY

A. The contractor shall warrant to the owner that all work shall be free from defects and will conform to the contract documents. This warranty shall extend not less than one year from the date of beneficial occupancy. See Division 0, Division 1, General Conditions, or other conditions of the Contract Documents for requirements.

1.5 SCOPE OF WORK:

A. The work covered by this specification shall include providing supervision, labor, supplies, materials (to include equipment), tools, services, documentation, tests & demonstrations, certificates, and dollar costs required to construct the complete systems as specified herein and as shown by the plans and other relevant documents. Without limiting the generality thereof, the major items of the work are:

1. Electrical system.
2. Special systems or elements as indicated.
3. Necessary services and support work, including transportation, materials handling, inspecting, storage, guarding, scaffolding, hoisting, etc.
4. Sales tax, permits, inspection fees, approvals, licenses, registrations, and certificates.
5. Coordination, notifications, inspections, field surveys of the job site, and reports.
6. Tests and demonstrations.
7. Submittals, including shop drawings.
8. Replacement of defective work if applicable.
9. Demolition and salvage.

1.6 INTERFACE OF ELECTRICAL WORK:

A. Drawings are based on design loads of one manufacturer. If equipment actually furnished have loads, numbers of connections, or voltages other than those indicated on the drawings, then control equipment, feeders, and overcurrent devices shall be adjusted as required, at no additional cost to the Owner. Such adjustments are subject to review by the Engineer/Architect.

B. Integral starters or devices requiring power circuit wiring, but furnished under the Mechanical Section of the specifications, shall be connected under the Electrical Section, in accordance with connection diagrams furnished with the materials (equipment).

C. Separate devices required to meet electrical disconnection or protection requirements, and requiring power circuit wiring, but not furnished under the Mechanical Section of the specifications, shall be furnished and installed under the Electrical Section of the specifications.

D. Unless otherwise specifically shown or noted by electrical plans, pilot duty control systems and related wiring for mechanical equipment shall be provided under the Mechanical Section of the specifications.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Provide a dry, weathertight space for storing materials. Store packaged materials in original undamaged condition with manufacturer's labels and seals intact. Handle and store material in accordance with standards to prevent damage. Equipment and materials shall not be installed until such time as the environmental conditions of the job site are suitable. Replace damaged materials.

1.8 CLEANING AND PAINTING

A. Remove oil, dirt, grease and foreign materials from all equipment to provide a clean surface. Touch-up scratched or marred surfaces of lighting fixtures, panelboard and cabinet trims, and equipment enclosures with paint manufactured specifically for that purpose. Paint plywood backboards used to mount electrical equipment with two coats of light gray semi-gloss enamel.

PART 2 - PRODUCTS

2.1 DISTRIBUTION EQUIPMENT:

A. Equipment shall be suitable for use on either a 208Y/120 Volt, or 480Y/277 Volt 3-phase, 4-wire, solid neutral grounded electrical system, as noted by the plans. Distribution equipment shall have a fault current interrupting capacity as indicated by the plans, in Amperes, RMS, Symmetrical. Verify fault current interrupting capacity is sufficient based on utility provided equipment.

B. Distribution equipment using circuit breaker type protective devices shall use bolt-on devices for all other distribution equipment.

C. Distribution equipment shall be as indicated and as manufactured by General Electric, Eaton, Square-D, or Siemens.

D. Panelboards shall be as indicated, and shall comply with UL standards 50, 67, and 489, and NEMA standards PB-1 and AB-3. Unless otherwise indicated for a particular panelboard, panelboards shall have a maximum width of 22 inches, a maximum depth of 5-3/4 inches, and minimum mains rated 100 amperes. Panelboards shall be factory assembled. Pole 'spaces' shall be bussed and ready for future installation of protective devices. Cabinets shall have full sized single doors provided with a chromium plated combination cylinder lock and catch and two keys. Provide additional features where indicated on the drawings. An inside circuit directory card shall be provided, mounted under a plastic cover in a metal holder, and completed using a typewriter. Circuit directory shall meet the detailed circuit identification requirements of N.E.C. paragraph 408.4.

E. Panelboard bussing shall be copper with branch device connections arranged in a vertically distributed consecutive phase sequence such that one or multiple pole breakers can be mounted in any position. A solid neutral bus shall be provided with feeder lug(s) and with a separate screw terminal for each branch circuit pole.

F. Disconnect switches shall be approved for the application, comply with UL standards 98, 198.2, and 198.4, comply with NEMA standard KS-1, and shall be Heavy-duty rated devices with quick-make and quick-break mechanisms. Ground lugs and all Code required accessories shall be provided. Switches located outside shall be the `NEMA-3R' enclosed type with locking hasp.

G. Unless otherwise indicated or required, fused switches in branch circuits shall use non-renewable cartridge fuses, as manufactured by Bussman, Littelfuse, General Electric, or Shawmut, rated 250 volts, dual element, current limiting fuses, Class `RK-1', or `RK-5', selected to provide starting and let-thru current as indicated or required. Fuses shall comply with U.L 198 series, U.L 512, and ANSI C97.1. Provide other sizes or special applications as indicated.

H. Starters and disconnect switches shall have quick-make and quick-break mechanisms, and be fully enclosed.

I. Branch circuit breakers shall be the molded case, automatic tripping type. Breakers shall have a minimum frame size of 100 amperes and a minimum trip size of 15 amperes. Branch circuit breakers shall be calibrated for a 40^{o}c ambient temperature unless otherwise indicated.

J. Service equipment shall be provided rated for building loads, including interrupting ratings. Service equipment shall be the type service entrance equipment as indicated by the plans. Other types of equipment and enclosure configurations that are suitable to the application, approved, and in accordance with local Code and Utility Co. requirements may be submitted for review. Service equipment shall be UL listed and labeled for use as service entrance equipment or materials. Switches used as service equipment shall as a minimum be heavy-duty rated, quick make and quick break, single throw devices having the following accessories: Lugs, ground lugs, locking hasps, connection adapters as necessary or required by Code, gutter space to suit the application, and current limiting, dual element fuses as indicated by the plans.

K. Identification: Install engraved plastic laminate sign on each major unit of electrical equipment. Provide a single line of text, 1/2" high lettering on 1 1/2" high sign (or 2" high sign if 2 lines required). Provide signs for each unit of the following:

1. Panelboards.
2. Motor controllers.
3. Disconnect switches.

2.2 CONDUCTORS:

A. Conductors shall be of soft drawn, annealed copper having a conductivity of not less than 98 percent by `ASTM' standards. Insulation rating shall be 600 volts, 90-degrees C. Conductors shall comply with U.L. 44, 83, 486, 493 and with NEMA WC-5 and WC-7. Unless otherwise indicated, conductors no.12 AWG size and no. 10 AWG size shall be solid. Conductors no.8 AWG size and larger shall be stranded.

2.3 RACEWAYS:

A. Raceway is required for all wiring, unless specifically indicated or specified otherwise. The minimum size of conduit shall be 1/2", but shall not be less than size indicated on the drawings or required by the NEC.

B. Rigid steel (RGS) and Intermediate Metallic (IMC) steel conduit shall be hot dip galvanized. Steel electrical metallic tubing (EMT) shall be hot dip galvanized outside, and enamel or galvanized finished inside. Raceways shall comply with UL standards 1, 6, 467, 651, 797, and 1242 and ANSI C-80.1 and C-80.3.

C. EMT couplings and connectors shall be metal and of the following types:

1. Raintight, hex-nut, expansion-gland compression type of steel, for any wet or damp location.
2. Set-screw or tap-on type, steel or cast metal, in dry locations, unless otherwise specified above.

D. Conduits shall be electrical metallic tubing (EMT) except for the following conditions:

1. Conduits which penetrate the building roof or exterior shall be galvanized rigid steel (GRS) or intermediate metal conduit (IMC).
2. Conduits installed within concrete slabs shall be GRS, IMC, or Schedule 40 heavy wall PVC. Where transition is made from raceway in slab to any type of raceway out of slab, make transition with a rigid galvanized elbow.
3. Conduits installed in direct contact with earth shall be Schedule 40 PVC.
4. Use flexible conduit for connections to motors, dry type transformers, flush mounted lighting fixtures and all vibrating equipment.
5. Length shall not exceed 18", except lengths up to 6'-0" may be used for lighting fixtures.
6. Maintain ground continuity through flexible conduit with a green equipment grounding conductor.
7. Liquid-tight flexible conduit shall be used in mechanical equipment rooms, exterior installations, and in kitchen and laundry areas.

E. EMT conduit couplings and connectors shall be steel raintight type. All EMT connectors shall be insulated throat type. GRS and IMC fittings shall be standard threaded couplings, locknuts, bushings, and elbows. All RGS and IMC fittings shall be steel or malleable iron; set screw or non-threaded fittings are not permitted. Non-metallic conduit fittings shall be of the same material as the conduit furnished and shall be the product of the same manufacturer.

F. All conduit support parts and hardware shall be hot-dipped galvanized. Conduit straps shall be single hole cast metal type or two hole galvanized metal type. Conduit support channels shall be 1 1/2" x 1 1/2" - 14 gauge channel, with 1/4" threaded steel rods used for suspension. Wire or chain is not acceptable for conduit hangers. Individual conduit hangers shall be galvanized spring steel specifically designed for the purpose. Individual conduit straps on metal studs shall be spring steel and should wrap around the entire face of the stud; tie wraps are not acceptable.

2.4 ENCLOSURES AND BOXES:

A. Equipment enclosures and boxes shall hot-dipped galvanized steel, malleable iron, gray iron, or copper-free aluminum, unless otherwise specified or required by NEC. Metal covers shall be of the same material as the enclosure. Screws shall be stainless steel except that aluminum boxes shall use aluminum screws unless otherwise indicated. Boxes shall comply with UL standards 50, 467, and 514.

B. Unless otherwise indicated for a specific application, floor boxes shall be as manufactured by Wiremold. Each box shall have means of adjusting box and cover to floor level.

2.5 WIRING DEVICES:

A. Unless otherwise indicated, wiring devices shall comply with NEMA standards WD-1 and WD-5, and shall be as follows:
1. Switches shall be standard line style, maintained contact, two position toggle switches, rated 20 amperes at 120/277 volts AC, quiet operating, and flush mounting. Switches shall have a self-grounding mounting strap feature. Switches shall be as manufactured by Leviton, spec-master, `specification grade', or equal by Hubbell, Pass & Seymour, or Arrow Hart.
2. Receptacles shall be standard line style, straight blade, 2-pole, 3-wire grounding type, rated 125 volts AC, and rated 20 amperes. Terminal screws shall have large heads for holding capability. Receptacles shall be flush mounting. Receptacles shall have a self-grounding mounting strap feature. Receptacles shall be Hubbell, Pass & Seymour or Arrow Hart.

PART 3 - EXECUTION

3.1 DISTRIBUTION EQUIPMENT:

A. For panelboards, branch circuit phases shall be numbered as facing the open cabinet, from the top position, left to right, with even numbers on the right and odd numbers on the left, unless otherwise required by local enforcement.

B. Panelboards shall be mounted with top of cabinet or enclosure 78-inches above the finished floor/grade, but with the bottom of the cabinet not closer than 6-inches to the floor/grade, shall be properly aligned and adequately supported independently of the connecting raceways.

C. Provide a fully suitable enclosed switch for each item of individual utilization equipment, including motors, and devices as required by Code or Contract Documents. Locate to provide full accessibility and working clearances required by the NEC. Locate adjacent to equipment served unless drawings indicate otherwise.

D. Review the electrical system design and the characteristics and nameplate ratings of associated equipment and devices, and provide switches and fuses, including heater elements, properly rated for the application in accordance with specification and code requirements, and with published manufacturer's recommendations and selection charts.

E. Where not otherwise indicated, all stationary fractional horsepower motors not provided with integral motor running overload protection, or inherently protected by design, shall be switched by a fractional horsepower starter providing supplementary protection.

F. Single-pole breakers used for multi-wire circuits shall be grouped consecutively on the same side of the cabinet.

3.2 WIRING DEVICES:

A. Wiring devices, boxes, wiring, and cover plates shall be coordinated to provide an installation, including grounding, that is in accordance with Code requirements, U.L. or other listing restrictions, and manufacturer's published recommendations for installation.

B. Cover plates shall be furnished for each device furnished or installed. Wiring device and cover plate finishes shall be selected by the Architect or owner.

C. Cover plates for flush, dry, ordinary locations shall be standard configuration, one piece, standard size plates with matching screws, and having materials, styles, and finishes as selected by the Architect or owner.

D. Devices shall be mounted recessed for flush installation, unless otherwise indicated.

E. Devices at different levels shall be aligned vertically; devices at the same level shall where possible be grouped using sectional gang boxes. Devices shall be centered in architectural features, unless otherwise indicated or functionally required.

F. Wall switches shall be located on the strike side of a door, six (6) inches from the door opening, unless otherwise indicated or functionally required.

G. Small flush mounted motor devices shall be mounted in standard device boxes and, where possible, provided with cover plates to match other device cover plates in the same visual area.

H. Unless otherwise indicated or directed by the Architect for special applications, wiring devices shall be installed with mounting heights above finished floors as follows: receptacles 18-inches to the bottom of the device, and switches 48-inches to the top of the device, as required by handicapped codes. Mounting heights for specific devices shall be as scheduled by the plans.

3.3 CONDUCTORS:

A. For general wiring in ordinary locations for power and lighting circuits operating at 600 volts and below, conductors shall be rated 60 hertz, 600 volts, with 90^{o}c insulation as follows:

1. Wet locations: THWN, or XHHW.
2. Dry locations: THWN, XHHW, or THHN.

B. Unless otherwise required by Code or function or indicated by the plans, conductors for power and lighting branch circuits shall be # 12 AWG size for branch circuits not requiring derating or size increase to reduce voltage drop.

C. Conductors shall be connected by U.L. listed connectors. Branch circuit wiring to size #8 shall be connected by connectors with live spring tension.

D. Branch circuit conductors pulled into ceiling or other raceway systems for future connection of lighting fixtures and devices shall be cut and ready for make-up of circuits, and shall have 8-inch length ends coiled in the box.

E. Where multiple conductors are connected to the same electrical terminal position, a separate (individual) lug shall be used for each conductor, including grounding conductors. Torque connections as recommended by manufacturer.

3.4 RACEWAYS:

A. Wiring shall be installed in metallic, rigid type raceways, unless otherwise indicated.

B. Raceways and cable shall be installed concealed, except that raceways designed only for surface mounting and raceways and cable in equipment rooms shall be run exposed, unless otherwise indicated.

C. Junction or pull boxes shall be provided where indicated or where necessary to avoid excessive runs or too many bends between outlets.

D. Concealed conduit run above the ceiling line shall be supported independently of ceiling construction. Where ceilings of the lay-in type may be used, conduits must be installed high enough to permit removal of ceiling panels or equipment. Support raceways within 3 feet of each box, change in direction, or termination point; otherwise, support raceways at intervals not exceeding 10 feet. Provide an expansion coupling wherever conduits cross a building expansion joint.

E. Exposed raceways shall be parallel or perpendicular to structural members or architectural features. Concealed conduit raceways shall be run in a direct manner with as few bends as feasible, and shall be coordinated with structural, mechanical and architectural requirements.

F. Conduits routed between spaces of different ambient temperatures shall be sealed to prevent circulation of air as required by code, local inspecting authorities, or local utility co. regulations.

G. Raceway or cable, etc. that penetrates a fire barrier, such as fire or smoke rated slab, wall, ceiling, or other element, shall be installed with materials and methods approved for the application by local building officials. The Contractor shall be responsible for identifying each fire barrier from the Architectural plans, and for securing approval of materials and methods to be used for each type penetration.

H. Circular raceways shall be a minimum trade size as follows: 1/2-inch in general; 3/4-inch where containing `homerun' circuit wiring, or where containing more than three (3) conductors for power or lighting circuits. Provide larger size where indicated on the drawings or where required by the NEC.

3.5 ENCLOSURES AND BOXES:

A. Unless otherwise indicated, enclosures shall be:

1. Flush mounted type in public areas and areas with concealed raceways and/or other flush mounted devices. Set outlet box within 1/8" of finished walls.
2. Surface mounted type in equipment rooms, and areas with exposed raceways and other surface mounted devices.

B. Enclosures and boxes shall have volume and required wire bending and gutter space and features to comply with code requirements.

C. Boxes shall not be installed back-to-back and thru-wall type boxes shall not be used due to transmission of sound or heat and smoke. Boxes in the same fire rated wall or other such building element shall be separated by a minimum distance as established by local building officials, and if connected together by conduit shall be sealed to prevent the transmission of heat, smoke, and noise, with sealing method as approved by local enforcement.

D. Suspended ceiling construction shall not be used to support raceways, boxes or other items, except as allowed by code, accepted by the engineer, and accepted by the architect in writing for the specific item(s) to be supported.

E. Boxes for any special raceway system for power or lighting branch circuits shall be sized as specified and indicated by the drawings. Boxes for use with general raceway systems shall not be less than 1-1/2" deep, except where shallower boxes are required by structural conditions. Boxes shall not be less than 4" square or octagonal size, except that 4 by 2 inch boxes may be used where only one raceway enters an outlet box, or where any specific box size is needed to match devices and/or mounting hardware.

F. Floor boxes for installation in concrete floors on grade shall be the concealed type, flush with the floor, rectangular nominal shape, with flush cover plates. Flush covers and visible box rings shall be charcoal gray with matching finished screws, or carpet/tile flanged type. Boxes shall be/have:

1. Cast Iron body type for slab on grade, or other wet installation application.
2. Steel for slab above grade, dry concrete applications.
3. Separate sections for power, telephone and communications as indicated by the plans.

3.6 GROUNDING:

A. Electrical systems, equipment, and supporting structures shall be effectively grounded. Bonding jumpers shall be provided where necessary. Metal electrical raceways and fittings, joints and connections at equipment shall be mechanically and electrically secured to provide an approved equipment or enclosure grounding means, even when no other separate grounding means are also provided either inherently or by bonding. Metal raceways shall be electrically continuous throughout their length to provide an effective grounding path to the power service disconnect switch. Provide grounding electrode systems for services and separately derived systems; provide equipment grounding systems for feeder and branch circuits. Grounding shall comply with National Electrical Code Article 250. Equipment used for grounding shall comply with applicable UL and NEMA standards for grounding equipment.

B. Generally, green equipment grounding conductors are not indicated specifically on the drawings for each branch circuit; however, provide for each raceway a green #12 grounding conductor in addition to branch circuit conductors indicated.

C. Electronic equipment requiring special or isolated wiring shall be grounded as indicated. Where isolated grounding type power receptacles at each equipment location are necessary, provide an isolated ground for the equipment to the (one) point of ground of the serving separately derived system. Both neutral conductor and green isolated grounding type grounding conductors shall be grounded only at this point, unless otherwise required by local practices.

3.7 FASTENINGS AND SUPPORTS:

A. Unless otherwise indicated, select, size, and assemble foundations, supports, and fasteners.

B. Fastenings for securing conduit runs, light apparatus, etc. should be bolts, beam clamps, or driven or welded studs on steel work; toggle bolts on hollow tile or concrete blocks; steel anchors of the self-drilling or non-drilling types on solid concrete or masonry. Power driven studs may be used on steel and solid concrete where accepted by the Architect.

END OF SECTION 260000